

THE ROLE OF ORDNANCE LOGISTICS
IN THE CHICKAMAUGA CAMPAIGN

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE

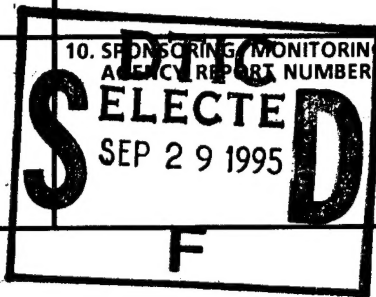
by

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other government agency. (References to this study should include the foregoing statement.)

ABSTRACT

THE ROLE OF ORDNANCE LOGISTICS IN THE CHICKAMAUGA CAMPAIGN by MAJ
Michael John Davis, USA, 134 pages.

This study is a historical analysis of the Chickamauga Campaign from the perspective of ordnance logistics. It focuses on the two major arms used on the Civil War battlefields, namely shoulder-fired arms and field artillery.

First, this investigation addresses the strategic capabilities of the respective forces in terms of the status of ordnance resources at the start of the war and the efforts to produce and obtain shoulder-fired arms, field artillery pieces, and ammunition for those systems. Secondly, it estimates the status of the Army of the Cumberland and the Army of Tennessee by applying logistical requirements, capabilities, and analysis to those armies. Finally, it examines ordnance operations in the Chickamauga Campaign in terms of today's logistical imperatives.

This study concludes the Army of Tennessee overcame strategic and operational logistical difficulties to enjoy effective and efficient ordnance operations during the campaign. Due to the tactical operations, they completed the campaign in a more advantageous logistical stance than they started. The Army of the Cumberland faced different challenges, long lines of communication, distribution difficulties due to the terrain, and their internal organization. Their ordnance system was not as efficient as the Confederates and contributed to their defeat.

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CHAPTER ONE

INTRODUCTION

My men fought them by firing until out of ammunition and when I sent to Colonel Mitchell for orders and was directed to hold the hill at the point of the bayonet, I bid farewell to home and friends, and the 113th. I gave the order and the men obeyed with spirit and over the hill we went, but the Rebels seemed not very anxious, and willing to stay back, and I let the men fall back over the crest and lie down and the few men from the cover of the trees who had supplied themselves with cartridges from the boxes of their dead and wounded comrades, we kept the hill until night when we received orders to fall back.¹ (Federal Officer)

General Preston, reassuring them by his presence, rides down the line and coolly examines each man's cartridge box, and says, "Men, we must use the bayonet, -the bayonet, -we will give them the bayonet."² (Confederate Officer)

The battle raged furiously and the tide of success wavered in the balance. Charge after charge was repulsed, only to rally and charge again. Again our line fell back, and the untiring, indomitable, and determined officers rallied again their fast thinning ranks and again moved forward. . . . The enemy's treble lines now began to show that our fire was terribly effective upon them. Our cartridge boxes had been replenished as required, and still we were nearly out. Again more ammunition was supplied and the conflict continued hot and heavy. The enemy was now slowly giving back, hard pressed by our now shattered remnants. Another charge, with the yells of the men and cheers of the officers, and forward we pressed, only to discover the victory was ours and the enemy was in full retreat.³ (Confederate Officer)

The words in the preceding paragraphs are first-hand accounts of one of the harshest campaigns of America's most costly war--the Chickamauga Campaign of the U.S. Civil War, August to September 1863. They serve to illustrate an important challenge facing military leaders,

not only during the Chickamauga Campaign, but in today's military as well--the supply of ammunition to warfighters on the battlefield.

Ammunition supply is a logistics function and logistical operations revolve around sustaining military operating forces. It furnishes the materials for war and is categorized as one of today's battlefield operating systems.⁴ The challenges faced by the combatants in the Civil War are in many ways similar to those logisticians face today. This study will examine the role of ammunition supply during the Chickamauga Campaign from 16 August to 22 September 1863 of the U.S. Civil War. In particular, this chapter identifies the purpose, background, and scope of the investigation.

Some historians have called the U.S. Civil War "the first total war,"⁵ with good reasons: first use of railroads in large-scale movement of troops and supplies; marked technological advances in ordnance and weaponry; the use of trench warfare; commonplace use of steam-powered and ironclad warships; war efforts involving whole populations of both sides; and combatants devising new ways of raising, sustaining, and commanding massive armies. Intrigued by American fighting methods, foreign observers reported on revised cavalry tactics, on new dimensions in firepower, and on democratic reactions to regimentation. A striking visual record of the conflict remains, for it was the first war systematically photographed--by Mathew B. Brady and others.

The Chickamauga Campaign took place in Tennessee and northern Georgia in the fall of 1863. It followed two major Southern defeats, the Army of Northern Virginia's loss at Gettysburg in July, and the crucial Vicksburg Campaign (April to July 1863). After a 44-day siege,

Union forces under General Ulysses S. Grant captured Vicksburg, Mississippi. The Confederacy's stronghold on the Mississippi River was lost. This victory gave the Union control of the river and split the Confederacy in two. Vicksburg's capture, combined with the Union success at Gettysburg (July 1863), shifted the impetus of victory toward the North.

With major losses in the east and west, Tennessee became the next area of concentration. The Army of Tennessee, numbering about 67,300 men under General Braxton Bragg attacked a Union force of about 62,200, the Army of the Cumberland under Major General William S. Rosecrans.⁶ They met in northwestern Georgia along a small stream known by the Cherokee name of Chickamauga or River of Death. Each side suffered terrible losses from the desperate fighting, totaling over 37,000. The losses were comparable to those suffered during "America's Bloodiest Day"--Antietam, where the casualties totaled 23,582 in a single day of fighting.⁷ Confederate forces carried the day at Chickamauga, but failed to follow up the victory. Despite the victory, the campaign did not redress the South's loss of Chattanooga on the ninth of September.

Just as training and doctrine influences the performance and operations of tactical fighting forces in the field, many conditions outside the immediate battlefield influence logistical operations. To answer the question of what role ammunition logistical operations played in this campaign this research must encompass a wide scope of inquiry. Ammunition operations from the strategic level to the tactical must be examined in their entirety for both the Federal and Confederate forces.

Chapter two examines the strategic level of ammunition logistical operations for the Confederate and Union forces. It details ordnance types and production capabilities of the two sides. An understanding of the types of ordnance, the production facilities, and the government bureaus on both sides responsible for their operation is necessary to appreciate operational and tactical logistical operations.

An examination of the different ordnance items used by the opposing forces in the campaign is in chapter three. The ordnance pieces, artillery and small arms, require specific descriptions. Size, weight, and other physical characteristics are significant in this study. The seemingly small change to carry more rounds of ammunition per man rather than the common forty was a significant impact on the soldier. Simple characteristics like this affect the logistical operations to deliver ordnance to the warfighters.

Ordnance officers used every available type of transportation system to move ammunition. Railroad transportation of supplies, soldiers, and ammunition was used extensively during the Civil War. Literally millions of pounds of equipment, men, and supplies moved on the waterways throughout America. Both sides in the struggle tried to control these two lines of communication. Supplying ammunition to their forces challenged armies during the Civil War. As the weapons increased in complexity and diversity, the job of delivering the right type of ordnance at the right time to the right unit became harder. Field ammunition trains faced delivering an ever increasing variety of ammunition. This job became more complex as shortages developed. Chapter four looks specifically at ammunition logistical operations at the tactical level.

A key data point for ammunition logistical operations today is the ammunition use rate. Ordnance officers use terms like "Basic Load," "Required Supply Rate," and "Controlled Supply Rate" to plan support for battles and campaigns. A further research question exploring ammunition use in this campaign should prove instructive. Original combat records discuss ammunition requirements in detail. During battle, munitions are often left on the field after armies meet. Chickamauga is no exception. Records show the capture of ammunition and arms during the campaign. Shortages drove both sides to scavenge the battlefield for munitions. The influence on the campaign is another research question discussed in chapter four.

An assessment of the overall effects of ammunition logistics on the combat operations during the Chickamauga Campaign is in chapter five. This overall examination of the life cycle of ammunition and how it affected the actions of the combatants during the Chickamauga Campaign reveals parallels for today's ammunition logistical problems.

Endnotes

¹Colonel Darius B. Warner, 113th Ohio Infantry Regiment, Mitchells' brigade, in a letter home, 27 September 1863, Unit Files, Chickamauga and Chattanooga National Military Park, Ft. Oglethorpe, GA.

²William Miller Owen, In Camp and Battle With the Washington Artillery (Boston, MA: Tichnor and Co., 1956), 282-283.

³The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, Series I, Volume XXX, Part II -- Reports (Washington DC: Government Printing Office, 1880-1901), 476.

⁴U.S. Army, Command and General Staff College Student Text 63-1, Corps and Division Logistics (Ft. Leavenworth, Kansas: US Army Command and General Staff College, 1994), ii.

⁵J. F. C. Fuller, The American Civil War 1861-65 (Dehra Dun, India: Current Events, 1959), 120.

⁶Glenn Tucker, The Battle of Chickamauga (Pittsburg, PA: The Publishing Center for Cultural Resources, Eastern Acron Press, 1981), 12.

⁷*Ibid.*, 5.

CHAPTER TWO

STRATEGIC AMMUNITION LOGISTICS

Strategic ordnance operations affect operational and tactical operations. Arms and ammunition production today affects packaging, storage, maintenance, issue, and use in field conditions. The same was true for Civil War arms and ammunition production. Part I. of this chapter examines the weapons used and the production capabilities of the opposing forces in the Civil War. Only shoulder-fired weapons and artillery production are examined. The impact of pistols on the battlefield was insignificant. Officers preferred to have their swords in their right hands for command and control rather than their pistols. Medical reports indicate the vast majority of wounds were sustained by shoulder fired weapons or artillery. The first sections of this chapter examine general ordnance characteristics and Civil War developments. Following sections examine the production of shoulder-fired weapons, ammunition, and artillery for the opposing sides. Sources of information regarding weapons and ammunition production do not always differentiate between purchases and production by the federal government and the same by state governments. The state bureaus, particularly in the Confederacy, sometimes made their own arrangements for arms and ammunition. As part of the strategic logistical operations, the bureau management system of logistics must be understood. Part II. reviews the bureau system used during the war.

Part I. General Ammunition Characteristics

Ammunition includes a variety of devices used to deliver a kinetic, explosive, chemical, or pyrotechnic charge to a target. Today's military ammunition, more commonly called ordnance, includes grenades, aerial bombs, mines, torpedoes, rockets, missiles, and a broad spectrum of explosive and nonexplosive projectiles. Common usage limits the term, ammunition, to devices designed to be ejected from a firearm.

Ammunition consists of three basic elements: the primer (detonator), the propellant, and the projectile. Most ammunition today also has a casing, or cartridge, which encapsulates the primer and propellant and often grips some portion of the projectile.

Early ammunition was assembled as needed. A fine black powder served as the primer charge to detonate the propellant charge, a coarser powder. Matchlocks, wheel locks, and flintlocks were used to ignite the primer charge. A new method of ignition, the percussion cap, was introduced in the early nineteenth century. This was a soft copper cup filled with a sensitive explosive, usually fulminate of mercury, and placed over a nipple with a small hole leading to the propellant. A hammer struck the cap and fired the weapon. Percussion caps survive in the form of primers located in the center or the rim of the base of modern cartridges.

From the late thirteenth century to the late nineteenth century, the sole propellant was black powder, or gunpowder. Its composition has varied little in seven centuries, the traditional recipe being 10 percent sulfur, 15 percent charcoal, and 75 percent saltpeter (potassium nitrate). Although unchanged for centuries, black powder has its drawbacks. It produces a large cloud of smoke and fouls the bores

of firearms after relatively few shots. Black powder also readily attracts moisture, hence the admonition to "keep your powder dry." Nitrocellulose-base smokeless powders, of which guncotton was the first, began to replace black powder in the late 1880s; within 20 years, they were used almost exclusively. The new propellants overcame black powder's deficiencies and were much more powerful.

Until the early nineteenth century, small-arms projectiles consisted of round lead-alloy or iron balls of fractionally smaller diameter than the weapon's smooth bore. Later, spiral-grooved (rifled) bores, designed to make the projectile spin, became prevalent, although smooth-bore shotguns of limited range still exist. Modern projectiles generally have pointed or rounded noses and are clad with copper or brass. The diameter, or caliber, of a projectile is expressed in fractions of an inch or in millimeters. With the arrival of more powerful smokeless powders, the caliber of military shoulder weapons has undergone a drastic reduction. The last U.S. military black-powder rifle round was .45 caliber (0.45 inch); a .30 caliber round replaced it; today the caliber is .223, or 5.66 millimeter.

Paper cartridges, incorporating the powder and projectile into a paper casing, were introduced in Europe during the sixteenth century. The entire assembly was rammed down the bore. The first successful metallic cartridge to incorporate projectile, propellant, and primer was invented in 1836.¹ Experimentation during the next 50 years resulted in small-arms ammunition as we know it today.

Prior to the rifled musket, infantrymen used the smoothbore musket. Smoothbore arms are those in which the inner surface of the barrel or bore is entirely smooth. These weapons fired a round lead

ball which was cast slightly smaller than the diameter of the barrel. This allowed the soldier to ram the ball down the barrel to load the musket. The ball rested on a black powder charge which was ignited, generally, by a percussion cap struck by a hammer. The smoothbore musket was inaccurate at ranges beyond one hundred meters and although greatly used were made obsolete by the rifled musket.

Civil War Ordnance

The most important development during the Civil War was the adoption of the rifled musket as the standard infantryman's weapon. The rifled musket had increased range and accuracy over the smoothbore musket because of two complimentary developments. The minie bullet, developed by a French army captain fifteen years before the war, had a conoidal nose and a hollow end which expanded under pressure from the black powder propellant. A hollow base was fitted with a hard iron plug. As the rifle fired, the hard plug was driven into the softer lead sides. The lead expanded into contact with the second development, a rifled barrel. The rifling imparted spin to the bullet. The spin stabilized the projectile and thus gave it more accuracy. The trapping of more gases in the barrel gave the projectile more velocity and thus a greater range. By 1855 the U.S. Army had adopted both these developments and by 1861, Federal arsenals produced the .58 caliber rifled musket in mass quantities.

Other innovations affected shoulder fired weapons of the day. One was the Maynard tape primer system. The tape primer system used a paper tape containing fulminate of mercury patches, something like a child's roll-cap pistol. Patches fed over the nipple leading to the

chamber. When struck by the hammer, the detonation ignited the powder in the chamber and fired the rifle. The system was commonly used on sporting weapons. Compared to other systems, it was cheaper, safer, and easier to operate than fitting a percussion cap into place under the stress of battle. Unfortunately, the Maynard tape primer system was particularly sensitive to the elements. If the paper tape became damp, it failed to feed properly and misfires occurred. This system was rejected by the U.S. Army after the Model 1855 and the percussion cap was adopted for the Model 1861 rifle musket.

Shoulder-fired Weapons

As stated earlier the .58 rifled musket was the standard infantrymen's weapon for both sides during the war. That was not so at the start of the war. In November 1859, Colonel Henry K. Craig, the ten-year veteran as U.S. Army Chief of Ordnance, reported the numbers and types of government arms as follows:²

Rifles: 1385 each .54 caliber rifles now converted to .58 caliber; 43,375 each .54 caliber rifles still awaiting conversion; 4102 each .58 caliber Springfield Model 1855 rifles.

Rifled muskets: 33,631 each .69 caliber smoothbores now rifled and with percussion locks added; 24,105 each .58 caliber Springfield rifled muskets.

Smoothbore muskets: 275,744 original flintlocks now converted to percussion; 14,765 flintlocks fitted with the Maynard lock; 213,155 built as percussion muskets.

Less than 5 percent, only 28,207 from a total of over 610,262 shoulder fired weapons, were the latest .58 caliber rifled weapons. The remainder had been manufactured within the previous 30 years and the government was in the process of reducing the stock of older weapons when the war started. The new weapon cost about \$13.93, as

opposed to the smoothbore at about \$9.00 each.³ Many states' militia weapons had not been converted from powder to percussion cap, resulting in some units going to war with weapons basically identical to those used in the American War of Independence.

The entire stock of federal weapons had actually decreased by 1860 because over 30,000 smoothbores had been sold to private dealers and individual states. This program was stopped in January 1861 as the secession crisis drew closer. Some of these private dealers made fortunes selling the same arms back to the federal government at prices seven times higher than they paid for them.⁴ As the war started the U.S. Government had no more than 40,000 .58 caliber rifles and rifled muskets out of only 437,000 weapons. Fortunately, less than 25 percent of federal weapons were stored within the Southern states. During the last year before the war, Southern state militias requested and were sold their allotted quota of weapons. Secretary of War John B. Floyd's administration processed the state governors' requests, but the U.S. Ordnance Department under Colonel Craig was slow to process the shipments. Floyd was reputed to have depleted Northern arsenals to send arms to Southern states, but Secretary Floyd was exonerated by an investigating committee. William A. Arbaugh III and Edward N. Simmons describe the facts as follows:⁵

The Springfield (Mass) Armory had become so crowded in 1859 that was necessary to remove some of the weapons stored there. In December 1859, the War Department ordered one fifth of the arms at Springfield distributed among five Southern arsenals--at Charleston, S.C.; Fayetteville, N.C.; Augusta Ga.; Mt Vernon, La.; and Baton Rouge, La. The number thus transferred was 65,000 percussion muskets, 40,000 old flintlock muskets, which had been altered to percussion, and 10,000 rifled muskets. this was almost a year before Lincoln's election. Again, in 1860, 10,000 rifles and muskets were distributed by the War Department of which number the Southern and Southwestern States got only

2,849 or less than one third the number, and much less their quota.

Federal Shoulder-fired Weapon Production

Before the start of the war, Federal forces had two main shoulder-fired weapon production facilities: U.S. Government Armory Springfield, Massachusetts and Harper's Ferry Armory, Virginia.⁶ Springfield was the primary producer of the model 1855 rifled musket. Harper's Ferry produced a slightly shorter version of the 1855 rifled musket from 1857 to 1861, termed the model 1855 rifle.⁷ Forced to abandon Harper's Ferry on 19 April 1861, Federal forces lost a major production facility and reportedly destroyed 15,000 .58 caliber rifles and rifled muskets.⁸ Although the damage was great, Southern forces were able to salvage much of the tools, machinery, and parts for their use. They reestablished the production lines while acting quickly to dismantle the machinery and move it to Fayetteville, North Carolina and Richmond, Virginia.

Federal Rifled Arms

When the war started, the ready supply of .58 caliber weapons was issued quickly. By the end of May 1861, the Union Ordnance Department could only supply smoothbore percussion cap muskets.⁹ The Springfield Armory, in an effort to make up for the loss of Harper's Ferry, quickly began to modify the existing smoothbore .69 caliber weapons with rifling and accelerate the production of a refined version of the .58 caliber rifled musket.¹⁰

Springfield Armory employed about 3,000 men and produced about one-third of the rifles manufactured by the federal government during the war.¹¹ Its annual production rate grew to over 350,000 rifled

muskets per year. Model 1861 rifled muskets were the most produced shoulder-fired weapon during the Civil War. Despite expansion of government production in the North, the Ordnance Department was unable to keep up with the demand for modern weapons. To meet war needs, it was necessary to contract out .58 caliber rifled musket production. Table 1 shows the contractors and their production rates.¹²

In the tool development period before these contractors could begin producing weapons, government officials purchased arms of almost every type from private sources. Foreign arms sources were not overlooked. Federal agents bought over 1,165,000 rifles, muskets, and carbines from Europe during the period 1861-1862. The British pattern 1853 "Enfield" rifle musket was by far the most popular imported weapon. Used by both the Union and Confederate forces, despite its slightly different size, .577 caliber, it could use the same ammunition as the American .58 rifled muskets although not as well.

French and Belgian arms were imported in significant numbers by both combatants. Belgium's arms were based on French designs and they met with mixed response. Calibers of .69 and .71 were considered worthless by those issued them. Conversely, the .577 caliber was considered first class by all who carried it.¹³ Another European weapon popular with Union soldiers was from Germany. The Saxon rifle musket models 1851 and 1857 numbering some 27,000 were imported by the United States.¹⁴ The rifled musket was a .58 caliber and the only difference between the models was the model 1857's three inch longer barrel length.

TABLE 1

MODEL 1861 RIFLED MUSKET CONTRACTORS

| Contractor | Number Produced |
|---|---------------------------------|
| Alfred Jenks & Son, Bridesburg and Philadelphia, PA | 98,464 |
| Eagle Manufacturing Co., Mansfield, CN | 5,500 |
| William Mason, Taunton, MS | 30,000 |
| James D. Mowery, Norwich, CN | 22,000 |
| A.H. Waters & Co., Millbury, MS | Not known (very few) |
| William Muir & Co., Windsor Locks, CN | 30,000 |
| Sarson & Roberts, New York | 5,140 |
| Welch, Brown, & Co., Norfolk, CN | 18,000 |
| Norwich Arms Co., Norwich, CN | 25,000 |
| Parkers, Snow & Co., Meriden, CN | 15,000 |
| Providence Tool Co., Providence, RI | 70,000 |
| E. Remington & Sons, Ilion, NY | 40,000 |
| E. Robinson, New York, NY | 30,000 |
| Savage Revolving Fire Arms Co. Middletown, CN | 25,250 |
| C.D. Schubarth & Co., Providence, RI | 9,500 |
| S. Norris & W.T. Clement, Springfield, MS | Not known (several thousand) |
| J.T. Hodge & A.M. Burton, Trenton, NJ | 11,495 |
| Union Arms, New York, NY | Not known (several thousand) |
| Charles B. Hoard, Watertown, NY | 12,800 |
| Eli Whitney, Whitneyville, CN | 14,000 |
| Dinslow & Chase, Windsor Locks, CN | Not known (very few) |

Federal Breechloading Rifles

Breechloading rifles allow the bullet and the powder, either attached or unattached, to be inserted in the breech or end of the barrel. This system significantly decreases loading time. A soldier could achieve a rate of fire of 2-3 shots per minute with a rifled musket. Soldiers firing a single-shot breechloader could achieve a rate of 10 shots per minute. There were some officers who believed increasing the rate of fire did not increase reliable firepower. They argued soldiers would be tempted to fire too quickly and not take proper aim.

Reliable breechloaders were developed in the 1850s, but were slow to be accepted by the military. The wartime emergency and short supply of arms led to the purchase of breechloaders from U.S. manufacturers by the government. Long rifled muskets were particularly ill suited for the cavalry, because of the difficulty of loading while on horseback. A breechloader was more attractive to the cavalry and new models were more often offered to them in the form of carbines. Carbines are light, short-barreled rifles. The carbine is essentially the same as the rifle, but has a shorter barrel, a generally smaller caliber, and a more limited range. At least thirteen different U.S. produced carbines were used during the Civil War. Table 2 shows the weapon and the numbers bought by Federal or northern state governments.¹⁵

As acceptance of these weapons grew, the transition to breechloading rifles quickly followed. Breechloading rifles were produced in significant enough numbers to influence the war.

TABLE 2
FEDERAL AND STATE CARBINE PURCHASES

| Weapon | No. Purchased | Comment |
|------------------------|---------------------------|---|
| Ballard | 1509-Fed; ~20000 Kentucky | Single shot |
| Burnside | 55,567 | Developed by general officer |
| Ball | 1,002 | .44, .50 cal |
| Cosmopolitan | 9,342 | Only federal manufacturer west of the Alleghenies |
| Gallager | 22,728 | Invented by southerner, built in PA |
| Gibbs | 1,052 | Fire destroyed factory |
| Hall | 3,520 | .64 cal |
| Joslyn | 11,261 | 0.54 |
| Maynard | 20,002 | .50 cal |
| Merrill | 14,495 | Many captured by Confederacy |
| Palmer | 1,001 | .44, .50 cal |
| Remington | 20,000 | .46 cal |
| Sharps | 80,512 | Copied by the Confederacy |
| Smith | 30,062 | Many captured by Confederacy |
| Spencer | 94,196 | Rim-fired ctg. |
| Starr | 25,603 | Copy of the Sharps |
| Warner | 4,001 | .50 cal |
| Wesson | 151 | .44 cal |
| French carbines | 200 | .60 cal |
| Other foreign carbines | 10,051 | various calibers |

Union manufacturers produced breechloading rifles in the types and quantities noted in Table 3.¹⁶

TABLE 3
QUANTITIES OF BREECHLOADING RIFLES MANUFACTURED

| Weapon | Quantity | Comment |
|----------------------|----------|---------------------------------|
| Colt Revolving Rifle | 4,612 | .44 or .56 caliber |
| Henry Rifle | 1,731 | .44 Cal rim-fired ctg, repeater |
| Merrill Rifle | 583 | Top loaded |
| Sharps Rifle | 9,141 | Single shot |
| Spencer Rifle | 12,471 | Magazine fed |

Federal Small Arms Ammunition Production

Ammunition production depended on the black powder manufacturing capacity of the forces. Cannon, mortar, and small arms powders differed in mixture, but used the same raw materials discussed earlier in this chapter: sulphur, saltpeter, and charcoal. Federal forces depended on a total of fifteen privately owned and operated mills, but still imported 26,422,065 pounds of powders during the Civil War.¹⁷ It should come as no surprise that these mills were located in industrial centers roughly paralleling the location of arms producing centers. Locations of U.S. powder mills are shown in Table 4.¹⁸ Federal forces procured ammunition from the same variety of sources as they obtained the weapons themselves. As many as eleven different Federal arsenals did some form of small arms ammunition operations during the course of the war. Supplementing this

TABLE 4

U.S. POWDER MILLS IN 1864

| Name | Owner | Location |
|------------------------|----------------------------------|-----------------------|
| American Powder Co. | Nathan Pratt, agent | South Acton, Mass. |
| Bennington Powder Co. | A.G. Greer, agent | Bennington, Vt. |
| Buckfield Mills | J.C. Marble | Near Paris, Me. |
| Camden Mill | J.C. Marble | Camden, Me. |
| Du Pont's Powder Mills | E.I. Du Pont & Co | Wilmington, Del. |
| Empire Powder Co. | Smith & Rand | Kingston, N.Y. |
| -- | Smith & Larkin | Near Saugerties, N.Y. |
| Frontier Mills | Quackenbush, Steere, & Armstrong | Fairhaven, Vt. |
| Hazard Powder Co. | A.G. Hazard & Co | Xenia, Ohio |
| Mass. Powder Co. | Fay, Potter, and Thomas | Hazardville, Conn. |
| Orange Powder Co. | Smith & Rand | Barre, Mass. |
| Oriental Powder Co. | U.H. Jackson, pres. | South Windham, Me. |
| Schaghticoke Powder Co | Bliss, Greeley, & Marston | Schaghticoke, N.Y. |
| Union Powder Works | John Bickford, agent | New Durham, N.H. |

production were four state arsenals. Table 5 lists the federal and state arsenals.¹⁹

The Union also procured a large share of the small arms ammunition from private sources. Bullet and cartridge requirements were often supplemented by purchases from private manufacturers and from foreign sources. Table 6 shows the Federal ammunition purchases and fabrications from 1 January 1861 to 30 June 1866.²⁰ The ammunition itself ran from the simple to the complex. There were four types most

TABLE 5

FEDERAL AND NORTHERN STATE ARSENALS

| Federal | State |
|---------------------------------|------------------|
| Allegheny, PA | Indianapolis, IN |
| Benicia, CA | Frankfurt, KY |
| Columbus, OH | Columbus, OH |
| Frankford, PA | Albany, NY |
| Kennebec, MA | |
| Leavenworth, KS | |
| St. Louis, MO | |
| Vancouver, Washington Territory | |
| Washington, DC | |
| Watertown, MS | |
| Watervliet, NY | |

often used: paper wrapped cartridges, combustible cartridges, separately primed cartridges, and internally primed cartridges. Paper wrapped cartridges were the most common ammunition for muzzleloading weapons. To load the weapon, soldiers tore open the small package and poured the powder down the end of the barrel. They rammed the minie bullet down the barrel afterwards. When fired, a percussion cap or Maynard tape primer system ignited the powder, propelling the projectile. Since the bullet had to be rammed down the end of the barrel, the bullet had to be slightly smaller than the diameter of the barrel. For instance, a model 1861 Springfield .58 caliber rifle musket used a bullet .5775 inches in diameter and was fired by 60 grains of powder.²¹ As the weapons continued to fire the powder residue slowly

choked the barrel, making loading increasingly difficult. Bullets for breechloaders did not follow that pattern.

TABLE 6

FEDERAL AMMUNITION PURCHASES AND FABRICATIONS

| Designation | Purchases | Fabrications | Total |
|---------------------------------------|-------------|--------------|---------------|
| Cartridges for carbines | 157,658,931 | 50,617,898 | 208,276,829 |
| Cartridges for muskets, cal. .577/.58 | 46,409,514 | 424,441,565 | 470,851,079 |
| Cartridges for all other muskets | 8,766,400 | 221,571,978 | 230,338,378 |
| Percussion caps | 893,362,574 | 327,192,861 | 1,220,555,435 |

Breechloading weapons usually used the second type of cartridge, the combustible cartridge. This type of ammunition consisted of a single small package made of linen, nitrated paper or other combustible substance. A bullet and gunpowder were enclosed. Soldiers did not have to open the package to load their weapon. They inserted the entire packet into the breech of the weapon. When ignited, by a percussion cap, the case burned and the powder ignited, propelling the bullet. A safety concern with this system was premature fires due to pieces of burning cartridge left in the breech after a previous shot. Bullets for breechloaders were slightly larger than the diameter of the barrel. The slight increase in diameter ensures a gas tight fit on the rifling in the barrel and increased velocity for the projectile.

Separately primed cartridges consisted of a brass, copper, or rubber cartridge with a bullet attached to the front. A percussion cap struck by a hammer sent a flame through a small hole in the cartridge, igniting the powder and propelling the bullet. The used cartridge was then removed from the breech and another round loaded.

The last type of ammunition was the most advanced, the internally primed cartridge. This type most resembled small arms ammunition as we know it today. It consisted of a metal cartridge case filled with an appropriate powder charge and a bullet crimped to the open end. Fulminate of mercury, encased along the base of the rim, ignited the powder charge when struck by the hammer. Several variations of this method were patented during the period, the most famous being Smith and Wesson's rimfire patent.

Ammunition Packaging

Union ammunition for muzzle loading weapons was usually packaged in paper wrapped bundles of ten rounds. Wooden packing crates of 1,000 rounds were marked with the type of cartridge, and the date and place of manufacture.²² Sometimes these paper wrapped bundles contained one or more rounds of another type such as buckshot. Carbine ammunition came in packs from 7 to 50 rounds each, varying with number and supplier. Percussion caps usually came packed with the ammunition.²³ Private manufacturers used a variety of methods to package their ammunition. These methods included pasteboard boxes and paper-covered wooden blocks.²⁴ The weight of a single one thousand round case of .58 caliber ammunition was roughly 98 pounds. Since wagons at the time could optimally haul a 4000 pound load, an ammunition wagon loaded with

.58 caliber ammunition could reasonably be expected to haul 40 cases or 40,000 rounds of ammunition if it were loaded with only one type.

Confederate Shoulder-fired Weapons

Confederate forces came into being with an even grimmer arms situation than the Union. Since only a relatively small number of Federal arsenals were located in the south, initially the bulk of the Confederate weapons came from southern state arsenals. The Confederate Ordnance Department, led by Major Josiah Gorgas, reported the following weapons confiscated from Federal arsenals in 1861.²⁵

Rifles: 8900 each, .54 caliber rifles.
Rifled muskets: 1765 each, .58 caliber rifled
muskets and 972 each, .69 caliber rifled muskets.

It is reported that the Confederacy started the war with less than 20,000 modern, rifled arms while the North had about 100,000.²⁶ The South suffered from an immature industrial base when compared to the North. It is to their credit how quickly they responded to produce their own arms. South Carolina was one of the few Southern states that had a weapons production capability prior to the outbreak of the war. The William Glaze & Company at the Palmetto Armory in Columbia produced weapons for state forces, primarily the model 1842 percussion musket. Before the war the armory produced over 6,000 of these weapons for the state militia. During the war the armory produced no weapons, instead manufacturing cannon balls, minie balls, bomb-shells, and rollers for the powder mill were made.²⁷ The armory was partially destroyed by Sherman's forces in 1865.

Early in the war the capture of the United States' Arsenal and Hall's Rifle Works at Harper's Ferry was ordered. On 19 April 1861,

First Lieutenant Roger Jones, commander of the Union force protecting the arsenal, tried to destroy the plant rather than let it be captured by the South. He was not fully successful. Over 17,000 gun stocks were salvaged by Maryland troops and shipped to the Fayetteville armory.²⁸ Tools, machinery, and arms in all stages of assembly were salvaged. The manufacturing lines at Harper's Ferry continued to produce weapons, now for the South, for two months before the complete removal of machinery stopped operations. Armories in both Richmond, Virginia, and Fayetteville, North Carolina, split the machinery and began to produce similar weapons.

The Fayetteville Armory was United States property until it was seized by the State of North Carolina in 1861. Completed weapons were then offered to the Confederate states by North Carolina Governor Ellis. Machinery to manufacture the model 1841 rifle was sent from Harper's Ferry and Fayetteville began manufacturing copies in the spring of 1862.²⁹ The armory remained in operation until March 1865 when the approach of Sherman's forces caused the South to disassemble the machinery and secretly store it in an abandoned mine shaft. Federal forces learned of the effort and in May sent teams to recover the machinery to Raleigh.

Confederate Rifled Arms

The largest rifle and rifled musket producer in the South was the C.S. Richmond plant. This facility became the backbone of Southern weapon production. The Richmond Armory and Arsenal complex actually consisted of a headquarters section, the arsenal for storing and issuing weapons, a laboratory, an artillery works, and the armory where weapons

were produced. In the first three months after the armory was transferred to the Confederacy no arms were issued. Instead the time was spent repairing, preparing, and assembling the machinery moved from Harper's Ferry. The plant was estimated to have produced about 25,000 weapons per year. Richmond's plant continued to operate until the fall of Richmond in 1865. The C. S. Richmond rifles and muskets were almost identical to the Northern Springfield. Southern weapons did not use the Maynard tape priming system but the locks retained that distinctive shape. They stamped "C.S." over "Richmond, Va" on the lock.³⁰ The weapon enjoyed the same good reputation as their northern counterparts.

Located just west of the Richmond Armory was the Tredegar Iron Works. This was the only rolling mill in the South at the start of the war and was generally considered the largest gun foundry in the South.³¹ Throughout the war this mill made cannon, machinery, and armor plating for the Confederacy.

The Palmetto Armory in South Carolina mentioned earlier for musket production also produced the model 1841 rifle. It was an exact copy of the U.S. model 1841 "Mississippi" rifle.³² Manufactured by the Wm. Glaze & Co., only about 1,000 of these were made before the war started.

Another widely used southern rifle musket was the Austrian "Lorenz." This weapon came in two calibers, .54 and .59, with .54 caliber the most common. Copies of the Lorenz were manufactured by the Confederacy at a plant in Tyler, Texas. This may account for the large numbers of the Lorenz found in the western theater. Other imports were used and copied by the South as well.

The British Enfield was imported and used in large quantities by both sides. Confederate forces were quick to copy this popular arm too. The Ashville Armory in North Carolina manufactured shorter versions of the Enfield for almost a year. Activities were discontinued and the machinery moved to the Columbia, South Carolina Armory.³³ Ordnance works in New Orleans, Macon, Georgia, and Tyler, Texas also produced copies of the Enfield.³⁴ Like the North, Southern forces imported almost any weapons available. Arms merchants in Europe found ready markets in the South as well as the North. Confederate forces suffered restrictions in imports due to the blockade imposed by the Union. Despite the blockade, the South was able to get large numbers of the same weapons imported by the North such as Belgian, French, and German arms.

Confederate Breechloading Weapons

The South suffered from a shortage of modern arms at the start of the war and breechloading weapons were no exception. Southern breechloaders, usually carbines, came from two primary sources, pre-war purchases and captured Northern arms. The Confederacy did not have anything matching the contractor-produced breechloaders in the North. Pre-war purchases by the states of Georgia, Florida, and Mississippi included some 2,369 Maynard Carbines.³⁵

Just as the South copied Northern rifle muskets and produced their own, they did the same with breechloading carbines, although on a limited scale. The Sharps carbine, first issued to U.S. troops in 1854, was copied by the Confederacy and produced by the S. C. Robinson Co. of Richmond. Producing a weapon almost identical to the northern version,

this company only produced about 5,000 carbines during the course of the war.³⁶ Few breechloading carbines were made in the South. One of the better known was the Morse rifle made in Greenville, South Carolina. Cartridges for this carbine proved to be difficult to produce and the arm was never produced in great quantities.

Captured Northern weapons, from early Confederate victories, gave the South sufficient breechloading carbines that their use by Confederate cavalry became common. The sometimes unique ammunition used by these weapons posed a logistical challenge for Southern forces. In one case the 1st Virginia Cavalry was issued Spencer carbines, but when their cartridges ran out they had to discard the carbines. Joshua Gorgas reported that for the year ending 30 September 1864, a total of 45,000 small arms had been captured from Federal forces.³⁷

The Confederacy quickly established a number of ordnance related works throughout the South. Most did not produce weapons, but either stored and issued, or repaired already manufactured weapons. Table 7 lists the Confederate Arsenal, Depots, and Laboratories.³⁸ It does not attempt to catalogue all the state or privately owned facilities in the South.

Confederate Small Arms Ammunition Production

Just as the North's ammunition manufacture depended on the black powder manufacturing capacity of the forces, the same was true for the Confederacy. Ammunition manufactures recognized that most of the

TABLE 7

CONFEDERATE ARSENALS, DEPOTS, AND LABORATORIES

| | |
|---|--|
| Atlanta Arsenal, Georgia | Lynchburg Ordnance Depot, Virginia |
| Augusta Arsenal, Georgia | Macon Armory, Georgia |
| Charleston Arsenal, South Carolina | Knoxville Arsenal, Tennessee |
| Columbus Arsenal and Armory, Georgia | Nashville Armory and Arsenal, Tennessee |
| Chattanooga Ordnance and Repair Depot, Tennessee | New Orleans Arsenal, Louisiana |
| Danville Arsenal, Virginia | Richmond Armory and Arsenal, Virginia |
| Fayetteville Arsenal and Armory, North Carolina | San Antonio Mills, Texas |
| Jackson Arsenal, Mississippi | Savannah Ordnance Depot, Georgia |
| Little Rock Arsenal, Arkansas | Selma Arsenal, Alabama |

country's black powder manufacturing capacity was in the North. They established powder mills in six different locations. Largest of these was the Government Powder Works at Augusta, Georgia. As the South's principle supplier it produced 2,750,000 pounds of black powder during the war.³⁹ Other Southern mills included the Sycamore Powder Mills in Nashville, Tennessee. It produced roughly 500 pounds per day and a number of percussion caps until its capture. Manchester, Tennessee; New Orleans, Louisiana; Marshall, Texas; Columbia, South Carolina; and Petersburg, Virginia were other sites of black powder manufacture. Confederate forces produced ammunition at a number of locations during the war. Colocating arsenals, armories, and powder mills was standard practice and logically improved efficiency.

Confederate small arms ammunition production included the same four types of ammunition as the North. The primary difference in small arm ammunition was the advanced types of internally primed cartridges. The immature Southern industrial base limited production of advanced cartridges.

Packaging small arms ammunition in the south was similar to the Union's. Confederate packages usually marked the type, date, and place of manufacture of the cartridge. Containers were either marked with the bore diameter of the weapon or the diameter of the bullet. Some crates were marked with both. Cartridge packages that could be used with multiple weapons were sometimes marked with the intended rifles such as: "10 Cartridges MISSISSIPPI or AUSTRIAN RIFLE CAL.54. Atlanta Arsenal-July 1864."

General Characteristics of Artillery

The other major ammunition users on the Civil War battlefields were artillerymen. Initially, land artillery was divided into three types: the gun, the mortar, and the howitzer (which shares some characteristics of both guns and mortars). Traditionally, the term cannon has been synonymous with guns and howitzers.

The gun is a long-tubed cannon that fires a projectile at high velocity in a flat arc or trajectory. At first the damage it inflicted was the result of the weight of the projectile and its speed. Later developments included special shot for use against ships and canister, or case, shot against personnel. The introduction of rifling to smoothbore cannons in the mid-nineteenth century gave guns greater

accuracy. The substitution of breech-loading for muzzle-loading allowed weapons to be loaded more quickly and fired more often.

The mortar, perhaps the first form of gunpowder weapon, is a smoothbore piece with a short barrel; it fires its shells in a high arc. Instead of relying primarily on the velocity of the projectile to penetrate obstacles, the shells pass over and fall behind them.

Originally a compromise weapon, the howitzer used a medium-length tube to fire a mid-velocity projectile along a curved trajectory. By firing at a low angle, howitzers could achieve adequate range; at a high angle, they had the effects of a mortar.

Field Artillery Ammunition

Civil War field artillery ammunition fit into four general types: solid shot, common shell, spherical case, and canister. Solid shot for smoothbore cannon was made of cast iron formed in copper molds. It proved a good general purpose round, effective against massed troop formations, fortifications, and buildings. Brutally simple, the round ball would skip across the ground and plow through formations like a bowling ball. Solid shot for rifled cannon was elongated and called a bolt. Although more accurate due to the spin, it was less effective against troop formations since it tended to bury itself in the ground rather than skip like the round shot.

Common shell came in the same two shapes but was filled with a low explosive (black powder) and fitted with a fuse. The round detonated and fragments produced antipersonnel effects. Unlike today's high explosive fillers, a low explosive like black powder did not have the power to produce the large number of fragments necessary to cause

the desired number of casualties. Common shell would usually only fragment into four or five large chunks.

A more efficient round was invented by British Captain Henry Shrapnel. He developed a hollow shell, packed with musket balls, and fitted with a time fuse. The fuse detonated a small charge at the proper time and freed the musket balls. The velocity imparted to the round already did the rest and the musket balls showered the target with deadly effect. A drawback to the round was the range accuracy required to achieve the desired effect. The gun crews had to fire so the round would detonate just in front of the target. This required accuracy in range estimation and quality time fuses to function properly. The round came to be known as spherical case or case shot.

A canister round, known today as a beehive round, was a tin cased container of iron balls with no explosive charge associated with it. These rounds turned cannon into large bore shotguns. Devastating against massed troops at close range, canister rounds lost effectiveness at long ranges. Canister rounds could be double loaded for close range firing.

Solid shot was fired with pre-sized cloth cartridges containing a measured amount of black powder. The shot and powder bag were inserted in the muzzle much the same way muskets of the day were loaded. Fixed ammunition, when the propellant and projectile are attached, was used in smoothbore guns. This more efficient system sped loading and helped ensure the fuse was positioned correctly for firing. Early time fuses depended on the flash of the propellant to ignite the fuse. If the projectile was improperly positioned with the fuse oriented too near the propellant, the projectile could explode in the barrel.

Civil War Field Artillery

The U.S. Army was in the process of upgrading its equipment before the war. Standard field artillery of the time included 6-and 12-pounder guns; 12-, 24-, and 32-pounder howitzers; and a light 12-pounder mountain howitzer.⁴⁰ Most field artillery pieces were known by the weight of the projectile fired rather than the bore of the cannon. The Model 1841 smoothbore field artillery piece was being replaced by the Model 1857 12-pounder "Napoleon" (named after Emperor Napoleon III of France) gun-howitzer. It was a multipurpose weapon designed to replace guns and howitzers and destined to become the most widely used field artillery piece during the war.⁴¹ Unlike rifle production, artillery pieces were all manufactured by private industry, although the arsenals did make carriages and caissons.⁴²

The Union produced "Napoleons" at five privately-owned foundries. Only a small number of these cannon were initially available. Five had been built by the U.S. Army for evaluation at the start of the war.⁴³ Thirty-six more were built by the end of the year and the U.S. Army ordered 179 Napoleons in 1861, 422 in 1862, and 512 in 1863.⁴⁴ Various states ordered Napoleons also, including Ohio, Massachusetts, and New Jersey. Just as Confederate forces copied several shoulder-fired arms, they also copied the Napoleon. About 630 of these cannon were made in Southern foundries. They could generally be distinguished by the lack of flare at the muzzle.

Although this new cannon was desired by both forces, early in the war the most common artillery piece was the six pounder smoothbore gun. Next was the twelve pounder version of these model 1841 systems.

The Napoleon could outdistance the older 12 pounder by about 600 yards. The true distance kings of battle however came to be rifled cannon.

Rifled artillery use expanded and became common for field use during the war. Early systems using bronze tubes with rifling proved unreliable since the rifling wore quickly. Still, the James system of rifling on bronze tubes was used despite the drawbacks. Parrott and Rodman guns became commonplace quickly. The gunmaker R. P. Parrott, Superintendent of the West Point Foundry, New York, made cannon by surrounding a central tube of cast iron or steel with wrought iron or steel hoops. Thomas J. Rodman devised a method of casting barrels around a removable core that was cooled with water; each successive layer shrank and compressed the previous layer. Both methods offered artillerymen an accurate, deadly weapon.

Rifled cannon were not without their problems. Since bronze cannon could not be rifled reliably, cast-iron rifled cannon were made. Early models tended to burst the brittle cast iron. Parrott's banded rifles did not totally solve this dangerous situation. Artillerymen on both sides were killed and injured throughout the war by their own bursting cannon. The Rodman or ordnance rifle was the other main type of rifled cannon on the battlefield. Rodman pieces were made with wrought iron and unlike the James or Parrott guns were referred to by the diameter of their bore rather than the weight of the shell.

The Confederates faced their usual situation: too few weapons and too little industry. The most striking difference that appears when one compares capabilities is in rifled cannon. Southern forces had few compared to the North.

Civil War Era Fuses

As the complexity and capability of artillery developed, the need for reliable and safe fuses grew. Early Civil War fuses were typically a cylindrical paper tube containing a paste of black powder. The outside of the fuse was graduated. Each mark indicated one second of burning time. Gunners estimated the time desired and cut the fuse accordingly. Union gunners had an advantage since all fuses of this type were manufactured at the Frankford Arsenal.⁴⁵ Confederate fuses were manufactured at several locations and were not consistent. Capt Eli Lilly, an artilleryman from the Eighteenth Indiana Battery reported, "One of their shells fell near one of my guns when Private Sidney A. Speed seeing the fuse still burning, picked it up from among my cannoneers and threw it over the house near by before it burst."⁴⁶ Such fuses relied on the flash from the propellant to ignite them.

Another development was the "Bormann time fuse." It was a screw thread attached disc containing powder. Gunners pierced the thin metal disc at the appropriately marked time. The Bormann time fuse was the standard fuse for Union smoothbore projectiles.

Rifled munitions used similar fuses. Percussion or impact fuses were slow to develop for spherical shells. The spinning, elongated shells from rifled cannon however, could reliably be expected to strike nose first. Fulminate of mercury caps in the nose of the fuse detonated when struck by a plunger mounted behind the cap. Some variations of this type fuse had safety devices to prevent accidents if the round was dropped on its nose during normal handling.

Part II. Government Bureau Systems

Administration of the opposing armies during the Civil War was conducted by a system of bureaus based on a British system in use at the time.⁴⁷ Bureaus administered areas that today would be primarily combat support and combat service support activities. These bureaus reported directly to the War Department and not to the field commanders. The relationship most closely resembles the relationship between today's Departments of the Army, Navy, and Air Force and the geographic commanders-in-chief. The bureaus equipped the armies and the field commanders fought them.

There were a total of ten bureaus within the War Department. Bureaus were primarily supply and service commodity driven. Clothing, for example, was provided by the Quartermaster's Department. The Medical Department procured medical supplies and was responsible for the distribution of these supplies to the field. A Subsistence Department provided rations. Transportation of these supplies to the field armies was the additional responsibility of the Quartermaster's Department. There were five other supply and service bureaus used by the North during the Civil War. Recruiting was handled by the Adjutant General's Department. The others included the Pay Department, the Inspector General's Department, and the Provost Marshall General's Department. Noted logistics historian James A. Huston made the following comments on one largest of these bureaus, the Quartermaster's Department:⁴⁸

Perhaps the first to respond effectively to the new demands, and to maintain a high level of support throughout the war was the Quartermaster's Department. Handicapped at first by the loss of its chief, Brig. Gen. Joseph E. Johnson, who resigned after ten month's service as Quartermaster General to take a Southern Command in April 1861, this department showed the same deficiencies as the other in supplying newly mobilized troops, and in supporting the Bull Run

campaign. But Brig. Gen. Montgomery C. Meigs, an engineer officer of distinction and a capable and dynamic administrator who succeeded Johnson as Quartermaster General, introduced efficient procedures which in subsequent years freed the department from complaints by governors and commanders about supply shortages. There were cases where untrustworthy contractors failed to deliver or tried to defraud the government, but most of these developed at local procurement levels.

Arms and ammunition responsibilities lay with the Ordnance Department. Arsenal and armory operation, storage, and furnishing all manner of ordnance equipment including horse equipment and tools were main function of this department. Public Law Number 38 enacted the expansion of several War Departments, specifically adding staff officers to the bureau and field officers selected from the officers of the army.⁴⁹ Neither Colonel Craig's, nor Brigadier General James W. Ripley's organizations were noted as models of efficiency, but such criticisms fail to account for the unprecedented demand for arms and ammunition. The rush to arm the forces sometimes ended with organizations working at odds with one another. An example is the case of General John Charles Fremont commander of the Department of the West. Through a confusing chain of events General Fremont purchased 5000 Halls rifles deemed obsolete by General Ripley and valued at \$3.50 each.⁵⁰ General Fremont purchased the arms at the price of \$22.00 each for his Missouri regiments. The ensuing incident, once the purchase price was made known, contributed to Fremont's dismissal.

When the Confederacy was formed, it copied the existing bureau system in the North. The Confederate Ordnance Bureau was responsible for developing, procuring, and fielding infantry and artillery weapons of all types. As pointed out in several sections in this chapter, the Confederate Ordnance Bureau had its work cut out at the start of the

war. Considering the obstacles they faced, the South did a miraculous job of equipping its forces. An additional internal obstacle effecting the South's arms and ammunition procurement and production was the nature of the Confederacy itself. "States Rights" inevitably conflicted, to some degree, with the centralized Confederate attempts to regulate or levy requirements. To the states' credit many turned over state arsenals to the Confederacy for operation. Examples include the Virginia Arsenal and the Little Rock Arsenal both of which were turned over to the Confederacy. Lesser cooperation examples were the governors of North Carolina and Georgia both of whom hoarded weapons to some degree. Reporting requirements came from the Confederate Ordnance Bureau. Ordnance officers at the corps, division, and brigade level were required to report their actions and of their details during each battle.⁵¹

Conclusion

Ordnance developments prior to and during the Civil War influenced the rivals' tactics, organization, and capabilities. The systems to develop, procure, and field ordnance to the armies greatly influenced the capabilities of the armies. At the start of the war, the Union had a considerable advantage in ordnance production. Most prewar production facilities for the United States before the war were located in the North. Despite this advantage, the North was forced to procure arms from almost any source available. Northern contractors produced rifles, carbines, and cartridges in quantities unimagined in previous years.

Southern forces captured or confiscated some arms and arms production facilities, but were never able to match the North's capability. They were faced with only four ways to arm themselves: convert privately owned arms, manufacture their own, purchase arms, or capture from the enemy. As we have seen in this chapter, the Confederacy did all these. That they did them so well is to their credit. This situation followed a general pattern of advantages enjoyed by the North over the South.

Artillery production underwent several significant changes during the Civil War.⁵² Metallurgy saw the change from bronze cannon to assorted cast, wrought, or combination irons and then to steel. Shapes of cannon changed overall from ornate to purely functional in design. Smoothbore artillery began to give way to rifled artillery. Muzzleloading replacement by breechloaders started. Again the North led the wave in these changes. Their production capability and especially their rifled artillery production far outstripped the Confederacy. Southern field artillery production was chiefly done at Richmond and Augusta. Southern armies typically drew their artillery supplies from these two major centers. The Army of Northern Virginia relied on Richmond and the Army of Tennessee on the Atlanta and Augusta Arsenals for its arms and ammunition.

In the decade preceding the war the North had expanded its rail network. Even though the two sides had roughly the same land mass area, the South had only about one half of the total railroad mileage as the North. The strategic production capability of the two combatants primarily depended on the rail network to move the equipment from

production facilities to the field. In this the North enjoyed another decided advantage.

After examining overall strategic capabilities it is necessary to next examine specifically what tactical ordnance capabilities existed during the Chickamauga Campaign.

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CHAPTER THREE

CHICKAMAUGA CAMPAIGN ORDNANCE

Today's ammunition support system's primary mission is to provide the proper types and quantities of ammunition at the decisive time and place on the AirLand battlefield to sustain maneuver units conducting combat operations.¹ In today's army there are the "big six" combat users: artillery, infantry, armor, air defense artillery, combat engineers, and combat aviation. That Chickamauga logisticians were primarily concerned with the first two in no way lessens the task they had before them.

In developing plans for combat operations, ammunition officers today perform the following estimate process:

1. Establish the requirements for ammunition support.
2. Confirm the capability of ammunition units.
3. Analyze requirement/capabilities.
4. Identify shortfalls in availability or distribution.
5. Make recommendations.

This estimate process is a method for planners to task organize and support operations. It is also a method to examine the Chickamauga Campaign to see what role ammunition logistics played in the outcome. The previous chapter examined the strategic capabilities of the two combatants. Rapid technological developments characterized the period before and during the U.S. Civil War. Weapons improvements met with

varying degrees of successful implementation. The emergency brought on by the war led to the implementation of many ordnance developments deemed too expensive to carry out before. We will see in this chapter that sometimes soldiers even gave up their own pay to get the latest weapons. Their sacrifice in pay may have saved their lives. The types and numbers of artillery pieces available during the Chickamauga Campaign reflect the general strategic capabilities described in chapter two. Union forces had more and newer field artillery pieces. Southern forces used predominately older types and had only about one fourth the number of rifled cannons. By applying today's estimate process to this campaign in the next sections of this chapter we can begin to understand the role of ammunition logistics in this operation.

Union Ammunition Support Requirements

Despite the widespread use of the .58 caliber rifled musket, it was by no means the only caliber weapon on the battlefield. Both the Confederate and Union forces had a variety of shoulder-fired weapons during the Chickamauga Campaign. Appendixes 1 and 2 of this thesis lists the Army of the Cumberland and the Army of Tennessee Order of Battle, the weapons and quantities available. The detailed information on many regiments is available there, however the list is not complete. This thesis does not examine the types and amounts of pistol ammunition, shotguns, nor musketoon ammunition. Although the amount of this ammunition was probably relatively small, it was still a consideration and a responsibility of the ordnance officers and men to supply. Today the amount of pistol ammunition moved in logistical operations in a

division is negligible compared to the tons of ammunition required for sustained combined arms operations in high intensity combat.

Ammunition Requirements for the Army of the Cumberland

Rosecrans wanted to carry enough ammunition to fight two major battles. Each soldier usually carried sixty rounds of ammunition on his person, forty in his cartridge box and twenty in his knapsack. Making the assumption that this amount was considered to be a basic load of small arms ammunition it must be doubled to 120 rounds to meet Rosencran's requirement for two battles. There were about 61,015 soldiers present for duty on 31 August 1863.² Multiplying the number of soldiers by the number of cartridges required equals the total planning requirement for small arms ammunition or 7,321,800 rounds of ammunition.

However each soldier carried his share of the ammunition as he marched, the basic load of 60 rounds. The figure requiring transport on wagons was probably more like 3,660,900 rounds. Since small arms ammunition was packaged in thousand round boxes weighing between 98 and 135 pounds the figure above required roughly 3,661 boxes. Wagons in use at the time could haul as much as four thousand pounds, but the terrain in that part of Tennessee and northern Georgia limited wagons to a figure more like two thousand five hundred pounds. Using that assumption the number of wagons required to move the small arms ammunition for the Army of the Cumberland was roughly one-hundred seventy two.

Another factor in small arms estimation was the number of different types of small-arms weapons requiring support. General Rosecrans' report following the battle praises his ordnance officer,

Captain Horace Porter for "the wise system of arming each regiment with arms of the same caliber."³ Captain Porter's success in arming the regiments with the same caliber weapon must be relative to the army's condition before the campaign. A number of regiments had mixed shoulder arms types but compatible calibers. This contributed to easier resupply of ammunition at the regimental level, but before the battle of Chickamauga only six brigades in the entire Army of the Cumberland had regiments without mixed calibers of shoulder weapons. Therefore brigade ordnance officers had to track weapon types carefully to supply all the needed ammunition. In the case of 1st Brigade, 1st Division, Brig. Gen. Baird, only four weapons of 1,446 were .69 caliber.

Union artillery forces in this campaign numbered thirty-three batteries usually organized with six guns each. Field artillery ammunition was carried in two locations on the battlefield. Artillery Caissons themselves could hold four ammunition chests per gun. The amount of ammunition in each chest varied by type. These ammunition chests held as much as fifty rounds and there were typically four chests on each caisson. Ordnance trains carried the remainder of the ammunition.

Capability of the Army of the Cumberland

Union forces throughout the war utilized rail transport of supplies and ammunition to the maximum extent possible. Logisticians used a system of base depots to stockpile supplies. Supplies generally moved from factories to base depots. From base depots the North's extensive rail network facilitated the movement of these supplies to advanced depots in the theater. Advanced depots were generally located

in major cities along good transportation lines of rail or river. While on campaign, temporary advance depots were established at a rail or water terminus. From that point supplies were off loaded, in what today is termed a transportation mode operation, and reloaded onto wagons to be driven to the army in the field. Literally thousands of wagons were necessary to sustain an army in the field and the further an army moved away from its temporary advance depot the more strained its supply lines of communications. One Quartermaster report cited 2,836 wagons, 16,428 mules, and 504 oxen as supporting the Army of the Cumberland north of Chattanooga.⁴

Fixed depots in Philadelphia, New York, Cincinnati, Louisville, and Saint Louis supported portions of the western theater and the Army of the Cumberland. The Tullahoma Campaign, in the summer of 1863, ended with General Bragg and the Army of Tennessee well established at Chattanooga and General Rosecrans and the Army of the Cumberland in camps along the western edge of the Cumberland Plateau in Tennessee. Despite pressure to advance to Chattanooga, General Rosecrans waited until railroads were repaired further south. Drawing supplies from its base depot in Louisville, the Army of the Cumberland established an advance depot in Nashville, Tennessee and temporary advance depots operating forward in Stevenson, Alabama on the north side of the Tennessee River, Bridgeport, and Tracy City.⁵ Once the Army of the Cumberland moved across the Tennessee River its logistical lines became even more strained. Wagons had to be ferried across a major water obstacle. Since the army now depended on wagon transportation for ammunition is necessary to examine how ammunition moved in the field.

The terrain in eastern Tennessee and northern Georgia is rough. Rosecrans described areas of it "a country destitute of forage, poorly supplied with water, by narrow and difficult wagon roads." Ordnance moved in trains following their regiments. Ambulances and ammunition came first and subsistence trains followed last. The division also had a purely ordnance trains under the control of the division ordnance officer. It follows that the corps trains had an ordnance train under the supervision of the corps ordnance officer. The tactical situation determined the location of these trains on the battlefield and on the march. Sometimes the subsistence trains were dispatched to rearward locations and the army proceeded to objectives with a minimal train of only ambulances and ordnance wagons. Division ordnance officers sometimes consolidated the regimental, brigade, and division ordnance trains directly under their control.

Army of the Cumberland Ammunition Analysis

The support requirements for small arms and field artillery were within the capability of the army ammunition supply system to meet. Several points stand out. The army almost certainly had enough ammunition available considering the basic load and the reserve ammunition in its trains. No reports of shortages are on record from commanders in the Army of the Cumberland. Since the ammunition was available in sufficient quantities it is necessary to examine the distribution capability. Captain Porter strived to consolidate types of weapons within regiments, an effort that would simplify resupply operations. Reviewing the number of wagons and animals available to the logisticians in Rosecrans's army reveals a sufficient number to haul

enough ammunition for two major engagements. The distribution system of the Army of the Cumberland should have been capable of meeting their ammunition requirements. The decision to keep the bulk of the supply trains in Chattanooga and only proceed with a minimum of sustainment, the ambulance trains, and the ordnance trains was a good one considering the difficult terrain. The only ammunition shortfalls detected in examining the Army of the Cumberland is distribution in difficult terrain with a poor road network even by the day's standard.

Ammunition Requirements for the Army of Tennessee

The Confederacy small arms ammunition supply situation at the start of the campaign was equally complex. In the Army of Tennessee alone there were small arms of the following calibers: .57, .58, .69, .54, .53, .70, Sharps, Maynard, shotgun, Hall, Smith, musketoon, and others. This list does not include pistol calibers. Their ordnance officer, Lieutenant Colonel Hypolite Oladowski, chief of ordnance, Army of Tennessee, reported thirteen different ammunition types available to support operations on 13 August 1863.⁶ General Braxton Bragg's ammunition supply planning requirement was quite clear. In a telegraph to the commander of the Atlanta Arsenal, Lieutenant Colonel Oladowski states his commander's reserve requirement as two million cartridges for small arms and ammunition for a hundred pieces at hundred rounds.⁷ This number equates to a figure of roughly 90 rounds per man for the army and matches a figure quoted by Oladowski describing the condition of General Forest's command as "well supplied."⁸ Artillery reserve ammunition requirements were not excessive considering the capability of the Army of Tennessee to move supplies from nearby Atlanta.

Army of Tennessee Ammunition Capabilities

The Army of Tennessee ammunition supply operations were conducted in the same general manner as their foes. Confederate forces used a similar supply and transportation system as the North with its system of base depots, advance depots, and temporary advance depots. Bragg's army was about 117 miles from Atlanta, but did not initially draw his support from that major depot area because its primary support was to the Army of Northern Virginia. By the time of the Chickamauga Campaign Bragg was able to draw supplies from the Atlanta Arsenal and Lieutenant Colonel Oladowski regularly communicated with Colonel Wright, the arsenal commander. Three towns located progressively southward toward Atlanta were the sites of advance depots. Logistical sites in Ringgold, Dalton, and Calhoun, Georgia each supported the Army of Tennessee. The terrain was no more favorable to the Confederacy ordnance wagon trains than it was to the Union.

The ordnance trains of the Army of Tennessee operated in much the same manner as the North's. Regimental, brigade, and division trains accompanied their respective regiments, brigades, and divisions. Ordnance officers were in charge of ordnance trains in brigades and higher commands. Lieutenants and captains usually worked at the brigade level while an ordnance major coordinated the efforts of all ordnance trains in the division. All these ordnance officers resorted to the chief ordnance officer in the army, Lieut. Col. Oladowski. The number of wagons required for each regiment was established in a General Order for the Army of Tennessee. General Orders No. 182, Army of Tennessee, required each battery of artillery to have wagons to enable it to carry 200 rounds of ammunition to each gun, including that in caissons. There

will be a brigade ordnance train of one 4-horse wagon for every 375 men present for duty, and a reserve train for each division of one 4-horse wagon for every 375 men present for duty.⁹

Analysis of the Army of Tennessee Ammunition Estimates

Ordnance officers had been preparing for the coming conflict around Chickamauga for some time. The requirements for reserve ammunition were well known and they had been working for some time to meet them. Operating on interior lines helped them build supplies. A shortage they could not easily overcome was in the type of small arms available. Lieutenant Colonel Oladowski reports a proportion of smoothbore muskets to rifled arms at one to three. As fate will prove out they greatly improved this percentage following the campaign. Ordnance operations had a clear chain of command, similar to today's ammunition operations. Brigade and regimental ordnance trains followed and supported their respective organizations. Their overall efforts were coordinated by the higher ordnance officer. A complication for the logisticians in Bragg's army was the arrival of Longstreet's Corps from the Army of Northern Virginia. He needed to procure wagons quickly to move Longstreet's supplies to get his corps into the fight. In the next chapter I will show that this clear chain of command contributed to successful Confederate ammunition operations.

Conclusion

Applying today's methods of staff estimation to the situation logisticians found themselves in September 1863 reveals some interesting points. The terrain proved to be a factor in the logistical plan to support the maneuver units. As the Army of the Cumberland advanced

further southeast they moved further from their temporary advance depot in Stevenson, Alabama. If this were not strain enough, a further complication was the major obstacle caused by the Tennessee River interdicting their line of communication. Terrain was another factor. Wagons designed to carry four thousand pounds could manage just over half that weight in the rough mountains of southeast Tennessee and northern Georgia. Not only could they not carry a full load but their speed of march was significantly reduced. Terrain restrictions limit distribution capabilities for units strung out along a narrow line of communication. Restrictions aside, the Army of the Cumberland was capable of sustaining ammunition operations in the field for this campaign.

Bragg's Army of Tennessee generally reflected the status of the Confederacy as a whole. Their equipment was generally less modern than their Northern counterparts. The lack of standardization of arms complicated the supply operations at all levels. They had a well established system of ordnance reporting and chain of command that contributed to effective operations. Interior lines of operation was one advantage the Army of Tennessee enjoyed since most of their ordnance supplies during the buildup were drawn from a closer location, the Atlanta Arsenal. Similar restrictions on wagon transportation challenged the ordnance officers and details in the supply of ammunition to the field. Despite the difficulties in supplying an army of over 60,000 ammunition operations were not only feasible but proved efficient. Probably the biggest challenge facing the Confederates was modernization. They had sufficient arms but many were obsolete smoothbore weapons. Ironically after the Chichamauga Campaign they would be much improved thanks to the Army of the Cumberland.

Endnotes

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CHAPTER FOUR

CHICKAMAUGA CAMPAIGN ORDNANCE OPERATIONS

The primary mission of the Army's ammunition support system is to provide the proper types and quantities of ammunition at the decisive time and place on the AirLand battlefield to sustain maneuver units conducting combat operations. Success of the ammunition system will be measured by its ability to deliver ammunition to operational and tactical commanders, to support generation of combat power and to achieve the tenets of the AirLand Battle.¹ (Current ammunition support mission).

Almost every unit on the battlefield requires some sort of ammunition support, but supporting the maneuver forces and their combat support is the primary focus of Army ammunition logisticians. The same was true for the ordnance officers during the Chickamauga Campaign. Earlier chapters examined the strategic, operational, and tactical capabilities of the forces involved in the campaign. The last chapter looked specifically at the requirements, capabilities, and challenges facing these Civil War logisticians. This chapter relates the performance of the ammunition supply system in its mission to provide the proper types and quantities of ammunition at the decisive time and place on the battlefield. It discusses the Chickamauga Campaign ammunition supply operations in terms of the sustainment imperatives used by today's logisticians. These five sustainment imperatives facilitate effective, efficient logistical operations. Field Manual 100-5, Operations, discusses five characteristics of effective and efficient logistical operations.² A brief summary of the five follows.

The first of these imperatives is *anticipation*. Anticipation includes the accurate anticipation of requirements. Identifying needs and developing versatile systems that can meet the needs of the maneuver elements requires good anticipation. At the strategic and operational level, anticipation may mean the formation of support systems that require development. Simply pushing the right support forward at the decisive time and place on the battlefield is anticipation at the tactical level. Logisticians who anticipate correctly build in the flexibility to shift support where required. Support systems provided by logisticians must integrate their systems with the operations developed by the commander. *Integration* is the next sustainment imperative. For a particular course of action to be successful, it must be supportable. Integration insures unity of effort. Ammunition support must be fully integrated into the entire operational plan. During combat operations, units committed to the fight must be quickly and continuously resupplied in order to maintain maximum combat power. *Continuity*, the third imperative is necessary to allow battle commanders to maintain the initiative in operations. Combat operations may enter periods of inactivity, but support systems seldom do and they must be prepared to rebuild unit combat loads and replenish depleted ammunition supplies during operations. Ammunition logisticians must be able to respond quickly to meet the changing needs of the maneuver units. The fourth imperative, *responsiveness*, demands ammunition units be flexible to react to crisis situations and to allow the commander to exploit opportunities. Best laid plans seldom, if ever, match the actual conditions of combat. The last logistical imperative, *improvisation*, is necessary to overcome unanticipated problems. Logisticians must be

prepared to surmount whatever problems occur to provide the required ammunition support to the warfighters.

Sustainment imperatives are used today to judge logistical operations. These five characteristics facilitate effective, efficient operations. Application of these imperatives contributes to successful operations today and they apply to the battlefield in Chickamauga as well. By examining the logistics of the Army of the Cumberland and the Army of Tennessee in terms of the five sustainment imperatives we can judge the efficiency and effectiveness of their ammunition support operations. The next sections focus on the Battle of Chickamauga, 19 and 20 September 1863, in terms of the application of *anticipation, integration, continuity, responsiveness, and improvisation* to their ammunition support operations.

PART I. THE ARMY OF THE CUMBERLAND

Anticipation

A very great meed of praise is due Capt. Horace Porter of the Ordnance, for the wise system of arming each regiment with arms of the same caliber, and having the ammunition wagons properly marked, by which most of the difficulties in supplying ammunition where troops had exhausted it in battle were obliterated. From his report will be seen that we expended 2,650,000 rounds of musket cartridges, 7,325 rounds of cannon ammunition; we lost 36 pieces of artillery, 20 caissons, 8,450 stand of small arms, 5,834 infantry accouterments; being 12,675 rounds less of artillery and 650,000 rounds more of musketry than at Stone's River.³

Major General William S. Rosecrans (Oct 1863)

General Rosecrans' praise of his ordnance officer's duty performance may well be deserved. Rosecrans knew what he wanted: enough ammunition for two major battles. Despite the extended supply lines and the obstacles of the terrain and the Tennessee River, indications are

that enough ammunition to meet that requirement was in the trains. Captain Porter, the other ordnance officers, and soldiers detailed to the ordnance trains made it happen. The logistical imperative of anticipation existed in several examples in the Army of the Cumberland. The next paragraphs provide evidence of their efforts to anticipate the needs of the army in the coming battle. Captain Horace Porter is the first example of an officer correctly anticipating a need.

Porter clearly anticipated the army's needs on the battlefield for effective, efficient ammunition operations. One clear contribution was his relative success in arming each regiment with the same caliber weapon.⁴ Certainly by today's standard the diversity in calibers extending down to the regimental level in the Army of the Cumberland seems great. However, Porter understood the need for simplicity in supply operations and probably did the best he could with the system he had. Another response by Porter to the anticipated "fog of war" was marking the ordnance wagons to make them distinguishable on the field. This simple act enabled troops to find their resupply of ammunition easier on a confusing battlefield. Captain Porter was not the only officer demonstrating anticipatory skills in the ammunition area.

Artillery officers were reported well supplied with ammunition at the start of the battle. Three separate reports by artillery batteries in the 14th Corps specifically mention entering the battle "full and complete." These include the 1st Michigan Battery, the 5th US Artillery, and the 4th Indiana Battery.⁵ Although only three batteries of the 35 and one third in the Army of the Cumberland mention their status prior to the battle, the official records have no reports of any battery entering the fight at a less than fully armed condition.

Considering the long buildup prior to moving to the Chickamauga area, one can safely assume all were fully mission capable at the start of the Battle of Chickamauga. The next sections focus on the 14th Corps. Reports in the Official Records offer no indication of ammunition activities from 21st Corps and only a few ordnance returns from the 20th Corps. Ahead will be one mention of General Steedman's division from the Reserve Corps.

Major General Negley, 2nd Division commander, 14th Corps, displayed good anticipation by several of his actions during this battle. He prudently protected his vulnerable logistical trains by sending most of his division trains to Chattanooga for safety on 19 September.⁶ Negley only kept his ambulance and ammunition trains with the division. He is also the only division commander who anticipated his brigades needing more ammunition than they currently had issued to them. On the eve of the battle, 18 September, he ordered Captain J. R. Hayden, his division ordnance officer, to issue an additional twenty rounds per man to each regiment.⁷ Hayden immediately did so as the brigades were moving forward to new positions. I believe this twenty rounds was in addition to the extra twenty normally carried in a soldier's knapsack. This brought each individual's total load to eighty rounds. Major General Negley correctly anticipated the need for extra ammunition at that late hour. Verification of Hayden's report of the extra ammunition issue came from Lieutenant William Moody, aide-de-camp to General McCook, where he confirmed Negley's order to issue 20 extra rounds of ammunition to the men.⁸ On 20 September his forces were heavily engaged and separated from his ammunition trains. Negley's anticipation of the need for more ammunition did not solve all his

distribution problems. As the division and its ammunition trains moved into position on the La Fayette and Rossville road, Negley anticipated problems getting the ammunition trains out of the natural gorge north of the Vittetoe house if the division was hard pressed and the gap blocked. He directed his topographical engineer, Lieutenant Ingraham, and Captain Hayden to find a road in their rear across the ridge to get the wagons out and onto the Valley road.⁹ They were successful in finding one steep, rough road, but when Hayden and Ingraham returned they found their division engaged and the ordnance train moved forward and left about a mile from its former position. As the fighting progressed, Negley ordered Hayden to withdraw nearer the gap. Hayden did some anticipating of his own here.

Moments before the gap came under enemy artillery fire, he divided his ordnance train. Hayden kept twenty wagons with him and sent the remainder through the gap in the charge of an ordnance sergeant. He ordered him to "park it as soon as he got to a convenient place on the left-hand side of the road."¹⁰ Hayden intended to stay as near the troops as possible with his twenty wagons. He described the gap as choked with vehicles of all descriptions, including wagons, ambulances, cassions, guns, couriers, and stragglers.

The tactical situation for 2d Division soon worsened. The brigades broke and Hayden's ordnance train found itself between their lines and the enemy's. With the gap totally choked, he had no other way to move to safety except up the steep ridge road he and Ingraham had reconnoitered earlier. Hayden described struggling to get his wagons up the hill and his frustration at receiving no help from the thousands of Union stragglers moving in the same direction. Finally, they made it to

the top except for one hopelessly stuck wagon. Hayden ordered the mules taken and the wagon abandoned in the hope it could later be recaptured. The ordnance officer then moved down the Crawfish Spring-Chattanooga Valley road trying in vain to link up with his division. He was eventually successful on 21 September where he was reunited with the other ordnance train under his sergeant and remainder of the division in Rossville. Hayden had saved all but one of his ordnance wagons.

Despite that fine performance, the ammunition distribution on the field must not have been prompt enough. Several commanders from the elements of the 2d Division report their ammunition being exhausted in the battle. Colonel Stoughton, 2d Brigade, 2d Division, reported, "Our ammunition became exhausted during the fight and every cartridge that could be found on the persons on the killed and wounded, as well as the boxes of the prisoners which we took, was distributed to the men."¹¹ Third Brigade reported a similar situation. Colonel Sirwell, describing the 21st Ohio Regiment, said, ". . . without hope they fought gallantly on; their ammunition giving out, they gathered cartridges of the dead and wounded, and then finally without a load in their guns, charged twice upon the rebel horde which was howling furiously around them."¹² The 21st Ohio reported expending 43,550 rounds in the afternoon, an average of 83 rounds per man.¹³ If you remember they each carried 80 rounds as they entered the battle, then there was probably little ammunition resupply during the fight. Unfortunately for the 21st Ohio they were armed differently than the Union forces to their flanks. They were one of the few regiments armed exclusively with one weapon type. This regiment used Colt revolving rifles which required a unique cartridge.

A final example of the Army of the Cumberland anticipating ammunition logistical needs came shortly after the battle. They feared Rebel pursuit to Rossville where most of the Union forces were recovering. J. A. Garfield, chief of staff of General Rosecrans, reported to Rosecrans:

The rebel ammunition must be nearly exhausted. Ours is fast failing. if we can hold out an hour more it will be all right. Granger thinks we can defeat them badly tomorrow if all our forces come in. I think you had better come to Rossville tonight and bring ammunition.¹⁴

Ordnance stores were readied quickly by the Army of the Cumberland. They telegraphed Chattanooga for provisions and ammunition and received them both. As it turned out the Army of Tennessee did not pursue the Union forces to Rossville.

Integration

Integrating logistical functions during the planing and execution of combat operations is imperative for successful operations. The official records yield indicators showing that the Army of the Cumberland integrated its logistical operations into the overall plan. From the start of the campaign General Rosecrans had shown concern about his logistical posture. The Army of the Cumberland was at the end of a logistical pipeline that started in the North, flowed by rail through Nashville to Stevenson, Alabama, and then by wagon to Chickamauga. Rosecrans had a mixed bag of ordnance to support. Despite efforts to arm regiments with the same caliber weapon, many units had a variety of shoulder-fired arms. The reserve ammunition for one regiment was not interchangeable with another's. The best example is in the 14th Corps when Thomas' ammunition train was sent to the rear by an unauthorized

person.¹⁵ General Steedman's command from the Reserve Corps arrived and gave them a small amount of ammunition that amounted to ten rounds per man. Unfortunately, the 21st Ohio was armed exclusively with Colt Revolving rifles. None of Steedman's ammunition fit their rifles. The 21st Ohio was reduced to fixing bayonets.

Other commanders showed their concern for integrated logistical operations by protecting their valuable trains and going into battle with only essential support: Ambulances and ammunition. Perhaps the most important integration aspect is shown by the concept of forward support, a keystone for today's support doctrine. Supporting forward moves supplies as close to the tactical units as the situation permits. In the Army of the Cumberland, as most Civil War units, ordnance trains habitually moved with their regiments and brigades. Hayden in the 14th Corps tried to stay with his forces, but events prevented him from doing so after being forced to withdraw up the ridge.

Continuity

Today's doctrine points out that any interruption in logistics operations diminishes the combat power of a force.¹⁶ As we will see in the next paragraphs the Army of the Cumberland did not provide continuity of ammunition logistical operations.

The most striking example of a failure in continuity of operations in the Army of the Cumberland is that of 14th Corps under Major General George H. Thomas. His situation on 20 September is best described in his own words:

By this time the ammunition in the boxes of the men was reduced on average to 2 or 3 rounds per man, and my ammunition trains having been unfortunately ordered to the rear by some unauthorized person, we should have been entirely without

ammunition in a very short time had not a small supply come up with General Steedman's command, This being distributed among the troops, gave them about 10 rounds per man.¹⁷

In the midst of fighting on the 20th, Thomas's corps had the most serious sustainment problem imaginable. His corps ammunition train had been sent to the rear "by some unauthorized person."¹⁸ Thomas reacted the best he could under the circumstances and sent two captains from his staff to the rear to find and return the trains but they were unsuccessful before Thomas' forces were driven from the field. The four divisions under Thomas were in a precarious position. The divisions themselves were having problems maintaining continuous support from their own ordnance trains. We have already followed 2d Division's ordnance trains led by Captain Hayden in their efforts to escape capture. The other three divisions had similar distribution problems.

1st Division reports do not include a report from their ordnance officer. Nor do the tactical commanders detail the movements or actions of their own ordnance train, but there are vivid accounts of the generally bleak ammunition situation. The 1st Brigade, 1st Division commander, Colonel B. F. Scribner, described everything assuming a discouraging aspect, their ammunition almost gone and staff officers sent returning without it.¹⁹ Battalion commanders like Captain Albert Dod, 1st Battalion, 15th US Infantry, recount staying in position until their ammunition was exhausted and then retiring from the field.²⁰ Dod describes a conversation with one of his company First Sergeants John Marrs:

Where all have behaved as well as they did on Sunday it would seem invidious to make distinction, but I beg leave also to mention First Sergt. John Marrs, afterward killed. His company, which had never before been under fire before, fell back. Sergeant Marrs was marching to the rear trying to steady the

men; his gun was on his right shoulder. I ordered them back, when Marrs faced to the front, brought his gun down, saluted and said, "Does the commanding officer know we are out of ammunition?" I told him to go back and fix bayonets, and every man returned, Marrs to fall almost immediately. The cool, soldierly bearing of this man under the terrific fire of Sunday evening was most commendable.²¹

Dod's account is an eloquent description of the consequences soldiers face when there is a failure of ammunition supply continuity.

Not everything in the 14th Corps was a failure. 3d Division conducted several successful ammunition supply actions during the battle. Not all the ordnance issued came from the brigade trains. In action on 19 September, Colonel Van Deveer, 3d Brigade reported, "After the second withdrawal of the enemy, our empty cartridge boxes were replenished from wagons sent on the field by the general commanding division."²² 2nd Brigade's Colonel Chapman relates how his division resupplied ammunition during the battle on Sunday.²³ He moved the brigade in mass back from the line about 300 yards, formed a new line to the left and right of an artillery battery, and replenished his soldiers with 60 rounds of ammunition each. 3d Brigade conducted a similar action withdrawing 200 yards and replenishing their exhausted ammunition.²⁴ But as the battle continued Brannan's division could not sustain their rates of fire. Negley's division did not hold the line to their right. Brannan was then open to attack on the right, left and front. His rear became so exposed that staff officers sent back for ammunition were successively cut off. He found his ammunition quickly becoming exhausted. When only two to three rounds per man remained Brannan ordered bayonets fixed and prepared for a last stand. Fortunately, he was able to withdraw his division after dark to Rossville without opposition. Brannan reported his retreat covered by

the 68th and 101st Indiana Volunteer Regiments, the only troops with ammunition.²⁵ Despite the mauling the 3d Division took, Brannan noted that his ordnance officer performed his duty well, supplying the ammunition promptly under heavy fire until his communication was cut off.

Thomas's last division, the 4th, under Major General Reynolds, went through similar circumstances on Sunday as the others. Reynolds noted the enemy was between him and his ammunition train. He stated, "But for this circumstance we could have maintained our position indefinitely."²⁶ 4th Division's ordnance train got safely to Chattanooga by another route. It is clear from this and other accounts that the Army of the Cumberland did not maintain the continuity of ammunition support necessary to support combat operations.

Responsiveness

The true responsiveness of the Army of the Cumberland during the Battle of Chickamauga is difficult to ascertain. The lack of ordnance reports from all but the 14th Corps make the overall responsiveness of the army difficult to judge. However if one examines the available reports there are a few examples of the army staff or command reacting rapidly in crisis, adapting units to requirements on short notice, reallocating the available supplies, and reestablishing shattered support systems. These are all characteristics of a responsive system. Again, due to the lack of reports we are forced to center on the 14th Corps.

Second Division's ordnance officer, Captain Hayden demonstrated a high degree of responsiveness in his actions on 20 September. Finding

himself in a crisis situation, he decided to split his ordnance train. His intent was to move the bulk of the ordnance to safety and still maintain support to the engaged combat forces. Hayden's actions clearly demonstrate the logistical imperative of responsiveness. Events unfolded too quickly to allow Hayden's action to influence the battle on that bloody Sunday when the Union forces were overwhelmed. It is difficult to say if the Union forces could have held their lines with more ammunition. The tactical movements of forces on the field that influenced the course of the battle are beyond the scope of this thesis.

To the credit of the Army of the Cumberland there are several accounts of reallocating the available ammunition. An example is from Lieutenant Colonel Henry Boynton, commanding the 35th Ohio Infantry, 3d Brigade, 3d Division. He described ammunition resupply, scavenging the dead and wounded, and how the 2d Minnesota shared ammunition with his unit:

The fighting continued for nearly two hours, when our ammunition became exhausted. . . . Fortunately a load of ammunition arrived and the firing was renewed with vigor. . . . At this point our cartridges again gave out, when by the exertions of several of our officers--among whom were Major Bud, Captain L'Hommedieu, Captain Daugherty, and Lieutenant Bone--the line was supplied with cartridges from the boxes of the dead and wounded. The attack progressing this supply was soon exhausted, when the officers and men of the 2d Minnesota kindly supplied us with several rounds, for which I take this opportunity to thank them. These were ordered to be so distributed as to give each man 3 rounds.²⁷

The Reserve Corps under Major General Gordon Granger issued some small amount of ammunition to units in the 14th Corps. Major General Thomas reported the corps would have been out of ammunition in a short time had not General Steedman's command arrived and issued them ammunition.²⁸ Major General Thomas was no doubt grateful for the

ammunition since his own corps train had been inadvertently sent to the rear. That small amount of ammunition was not enough. Lieutenant Colonel G. C. Wharton, 10th Kentucky Infantry marked in his report about the arrival of ammunition from Granger's Corps, but that they were still forced to gather cartridges from the dead and wounded, and finally to fix bayonets.²⁹

In attempt to be responsive to his logistical train Major General Negley lost unity of command within his division. On Sunday, 20 September, Negley was withdrawing two brigades when the enemy took advantage of the change and pressed the relieving force. Their attack was so fierce Negley was obliged to send one brigade back to reestablish his original line and to protect his ammunition train which was passing at the same time.³⁰ His action had the net effect of separating his division and destroying their unity of action. Major General Negley was unable to restore his division's unity during the rest of the battle. There are few examples of responsiveness in the Army of the Cumberland.

Improvisation

Improvised methods and supply sources can maintain logistics continuity when standard procedures fail. Standard procedures failed in the Army of the Cumberland at Chickamauga. There were only a few instances where improvisation on the part of the Union forces could, in some way, maintain the necessary continuity of support. Second Division's Captain Hayden demonstrated improvisation twice during the battle of Chickamauga. The first was on 20 September when, on his own initiative, he split his ordnance train and sent most of it to safety

toward Rossville under one of his ordnance sergeants.³¹ Hayden was determined to maintain support to the combat troops, but wisely chose not to risk his entire train in that situation. His analysis of the predicament proved correct. The gorge north of the Vittetoe House was soon a mass of confused, panicked soldiers and jumbled wagons all trying to escape the Confederate artillery fire. Hayden's ordnance sergeant got his train through the gap before the situation got bad. In splitting his force, Hayden's action contributed to the survivability of at least part of the division's ammunition train. Another instance where this officer demonstrated improvisation was in abandoning his stuck wagon as he withdrew his ordnance train over the ridge toward the Chattanooga Valley road. Hayden ordered the mules unhitched from the wagon and left it in place. He hoped the fortunes of the war would keep the Confederates from making off with his wagon and he could recover it at a later time. Unfortunately for him it did not work out that way. Still, he performed better than the other divisions in 14th Corps. Fourteen fully loaded ordnance wagons belonging to 3d Division were captured by the Army of Tennessee during the Battle of Chickamauga.³²

Other instances on improvisation found on the Union side were the numerous cases of men gathering whatever ammunition was available from any source. The main source of unused ammunition came from the cartridge boxes of the dead and wounded. Considering the number of Union casualties this is no small amount of cartridges. In the case of uncommon calibers, like the 21st Ohio's Colt Revolving rifles, finding ammunition among your own dead and wounded may have been their only ammunition source. Units to their right and left used .58 caliber

rifled muskets and could not have shared ammunition even if they had some to spare.

PART II. - THE ARMY OF TENNESSEE

The Official Records of the War of the Rebellion offer a much more complete picture of ordnance operations in the Army of Tennessee than for the Union forces in the campaign. The result is that it is prudent to introduce some Confederate ammunition logisticians whose influence on the logistical operations in the Battle of Chickamauga are felt in almost every area. The first of these is Colonel Josiah Gorgas, Chief of Ordnance for the Army of the Confederacy. Colonel Gorgas was the ordnance bureau chief and consequently was responsible for the arms and ammunition used by the Army of Tennessee. His most important contact in that army was Lieutenant Colonel Hypolite Oladowski, the chief of ordnance for the Army of Tennessee. The two men kept a nearly constant stream of letters and telegraph messages between the army in the field and the bureau in Richmond coordinating ammunition activities. Within the Army of Tennessee itself were ordnance officers at several high levels of organization. Major John Cheatham, Cheatham's Division of Polk's Corps, plays a particularly important role in supporting ammunition operations for his division. There are also reports from ordnance officers at the division and brigade level. Probably the most important reason for the relatively large number of reports is the requirement from Colonel Gorgas to report on their activities. Gorgas issued orders from Richmond on 24 June 1863 requiring corps, division, and brigade officers to "make reports of their action and of their detail during each battle."³³ Almost every ordnance officer's report

starts with some phrase referencing Gorgas' requirement. The reports from these officers provide a vivid record of the ordnance operations of the Army of Tennessee.

Anticipation

Ordnance officers and tactical commanders in the Confederacy began preparing for the campaign in August 1863. Bragg's army had been primarily served by the Augusta Arsenal in Georgia and continued to receive some supplies from it. General Bragg corrected a supply problem when he secured support from the Atlanta Arsenal. This simple act considerably shortened his lines of communication. As soon as that support was approved, Lieutenant Colonel Oladowski began contacting Colonel Wright, the Atlanta Arsenal commander, to submit requirements and coordinate support. One of the first of these was to report the types and calibers and arms in the Army of Tennessee.³⁴ Early in August the Confederate forces were still building in the Chickamauga area and Oladowski had not yet received reports from all the corps ordnance officers. On 13 August Oladowski submitted General Bragg's estimate of the small arms ammunition and artillery ammunition needed for the campaign. He sent Colonel Wright a request for 2 million cartridges for small arms and 100 rounds of artillery ammunition for one hundred pieces.³⁵ The General's estimate proved sufficient for the campaign.

Lieutenant Colonel Oladowski understood the need to prepare to support whatever type combat units needed ordnance support, not just infantry, artillery, and cavalry. His concern for the support to a group of engineer sapper companies showed in a request he wrote for

information on the formation of such companies and reporting that he had no arms suitable for their operation and he wanted to order enough for all the companies at once.³⁶ Later in September, Oladowski wrote to the commander of the Augusta Arsenal that the sapper and miner companies had one hundred men each and he had armed them with what he could get.³⁷

Oladowski also clearly understood the disadvantage of having smoothbore arms. Colonel Gorgas and Oladowski had probably corresponded on the issue many times, but Oladowski reported the proportion of arms in the Army of Tennessee was one smoothbore to every three rifled arms. He further stated he received requests nearly every day from the units to exchange their smoothbore arms for Enfields and he knew the impossibility of the request but wanted 3,000 rifled arms.³⁸

As the Army of Tennessee built its forces in August and September, it was necessary to provide and plan for ammunition support for those new units. One example is the contingent that came from Mississippi to join Walker's Division. On 31 August, Oladowski asked Gorgas for two thousand arms to equip the men from Mississippi.³⁹ Later than same day he sent a more detailed letter on the requirement to Colonel Wright stating he was ordered to have all the ammunition at Chickamauga and asked the Atlanta Arsenal to send all the small arms ammunition available and several types of artillery ammunition.⁴⁰ All these actions by Lieutenant Colonel Oladowski indicate he prepared the ordnance support as well as he could. Oladowski understood the different ordnance requirements of special units like the sapper companies and tried to support them. Rifled arms were at a premium in the Army of Tennessee and Oladowski tried to modernize his forces but the strategic Confederate system could not support it. Oladowski

receives high marks in logistical anticipation, but he was not the only ordnance officer anticipating the battle. Major John Cheatham anticipated ways to provide support for his division.

The brigade ordnance trains in Cheatham's Division were consolidated with the division trains on the order of Major-General Cheatham, the division commander.⁴¹ He took charge of the large train himself and did the following:

I reserved two wagons from each brigade train for any immediate demand that might be made, and sent the others in charge of an ordnance officer back to the creek as a precaution against any reverse that might attend our forces on the morrow's fight.⁴²

His actions were prudent and correct. Cheatham was able to provide direct, forward support to the division without risking all the division's assets. His was not the only division to operate that way. Hindman's Division of Polk's Corps operating under Longstreet did the same thing.⁴³ Officers like Major Cheatham, coupled with Lieutenant Colonel Oladowski's preparation for support to the entire Army of Tennessee, contributed to the next logistical imperative *integration*.

Integration

Ordnance units in the Army of Tennessee formed the habitual support relationships necessary for good operations with the combat units. Lieutenant Thomas Barret, Jackson's Brigade, Cheatham's Division summed up the support relationship in his report after the battle:

As we were in General Cheatham's division, I reported to Major Cheatham, his ordnance officer, with my ordnance train, and remained under his orders during the fight on the 19th, always in the rear of the brigade and supplying the troops with ammunition whenever needed.⁴⁴

The support relationship was not one way. Combat units were regularly ordered to safeguard the ordnance trains while in the field. Colonel

Claudius Wilson, 25th Georgia Infantry, reported how his brigade supported the division ordnance train:

The ordnance train of the division not having succeeded in crossing Friday night, I was directed by special order for division headquarters to remain with the train, holding my brigade as a guard until it crossed, and then to rejoin the division. I immediately detached the 13th Georgia regiment and sent it to the ford as a guard to that portion of the train that had not crossed, and to furnish fatigue parties to help forward disabled or stalled wagons, having first reconnoitered the position and thrown out two companies on each road leading to the ford to guard against surprise by the enemy.⁴⁵

The larger and consequently more vulnerable the ordnance train, the larger the force detailed to guard it. When it arrived at Catoosa Wood Station on the morning of the 19th, Gist's Brigade of Walker's Reserve Corps was ordered to guard a large ordnance train that was being prepared to support the operation.⁴⁶ After obtaining wagons for his own reserve ammunition, Gist waited most of the day while the ordnance train was formed. Despite the late start, 2200 hours, they marched all night, guided by a Ringgold resident, and completed their journey to Alexander's Bridge by the morning. Security of the ordnance train was passed to another unit and Gist's Brigade moved to its assigned position. This is only one of a number of examples of combat and ammunition support units in the Army of Tennessee closely integrating their operations. This close integration leads to the next logistical imperative and perhaps the Confederate's strongest suit in this campaign, *continuity*.

Continuity

The Army of Tennessee enjoyed a high degree of ammunition support continuity. One reason was the exactness of requirements for

ammunition and how it was prepared and carried on the battlefield. Army of Tennessee General Order No. 182 detailed exactly how much small arms and artillery ammunition was required and the number of wagons to carry it for flexibility in operations:

Each battery of artillery will have wagons to enable it to carry 200 rounds of ammunition to each gun, including that in cassions. There will be a brigade ordnance train of one 4-horse wagon for every 375 men present for duty, and a reserve train for each division of one 4-horse wagon for every 375 men present for duty.⁴⁷

This requirement was closely monitored by the ordnance officers.

Oladowski demanded to know why Major Duxbury, Hill's Corps ordnance officer, ordered the formation of an extra ammunition train and by what authority he ordered the issue of 250 extra rounds of ammunition for each gun in Hill's Corps.⁴⁸ Ammunition was a scarce enough commodity in the Confederacy that controls were necessary. The reports required by Colonel Gorgas in Richmond was his method of keeping tabs on the field armies. At the field army level, Lieutenant Colonel Oladowski required his ordnance subordinates at corps, division, and brigade to report twice monthly.

This close attention to detail paid high dividends on 19 and 20 September 1863. The Official Records are filled with accounts of combat units on the field receiving prompt resupply of ammunition during the battle. The location of the ordnance trains on the field vary from one half mile to three miles and ordnance details ran wagons forward during lulls in the battle to supply combatants. How the resupply to the lines was accomplished varied in situations. Sometimes entire brigades moved, en mass, off the line, were resupplied, and then moved to a reserve position. Brigadier General William Preston, Preston's

Division, described how he directed a brigade to occupy and hold a position evacuated by a brigade running low on cartridges. In this case, Gracie's Brigade withdrew a short distance, replenished his ammunition, and became the division reserve. Another example of resupply of a brigade-sized element was Brigadier General John C. Brown's Brigade, Stewart's Division. During the battle on the 19th, Bate's Brigade relieved his brigade while they moved to his rear, resupplied their ammunition, and moved forward again.⁴⁹ The ordnance officers in charge of these trains some distance from the fighting kept contact with their units on the line. Lieutenant John C. Harrison, acting ordnance officer, Walthall's Brigade, reported:

The ordnance of the brigade was kept during the engagement at the distance of about a half mile from the brigade and in its rear, keeping up a regular communication with the brigade by means of the details furnished for that purpose and the ordnance sergeants. Whenever there was a cessation in the firing I caused the ordnance sergeants to take charge of their details and furnish their respective regiments with such ammunition as they desired.⁵⁰

This method of operation was not unique. Capt Henry K. Beatty, ordnance officer of Smith's Brigade, described a similar operation and reported how he used his ordnance sergeants and details to remain, "in constant communication with my brigade, and acquainted myself, as far as practicable, with its movements by the medium of my sergeants and detail."⁵¹ Wright's Brigade's ordnance officer, Lieutenant A. Paine, described his detail's activities during the fight as chiefly watching the movements of their respective brigades to know their exact location in able to supply them ammunition at any moment.⁵² One last example of a unit moving together to the rear to get ammunition was the 1st Regiment, Arkansas Volunteers. Their commander described when their

ammunition was at last expended they were ordered to the rear to get a new supply while a fresh brigade occupied their position.⁵³

Not all the ammunition was pushed forward to units in large groups. Sometimes the tactical situation did not allow mass unit replacement. In some instances, units responded like Polk's Brigade, Cleburne's Division, which posted skirmishers to their front to oppose the advance of the enemy until the ammunition could be replenished.⁵⁴ The 35th Tennessee Regiment found their ammunition becoming exhausted. The commander alternatively retired the front and rear ranks of infantry and succeeded in falling back about a half mile before he was able to resupply his ammunition.⁵⁵

Because of the terrain Confederate artillery batteries used less ammunition than most engagements of this size. Their ammunition resupply was usually done by dispatching the empty caissons to the rear to the ordnance trains and returning full. Semple's Battery reported their ammunition becoming low, dispatching for, and receiving a fresh supply to continue operations on 20 September.⁵⁶

Not every report was as complimentary of the ammunition supply as those before. The 29th Tennessee Infantry ran low on ammunition and was forced to withdraw about 70 yards. In words similar to many Union reports, they gathered ammunition and distributed what they could find among themselves.⁵⁷ The biggest contrast between their situation and the Army of the Cumberland was their retirement from the line was on order from their higher command and was under control. Colonel Rice's report does not address how long they were out of action due to the lack of cartridges, but it was probably a short time since reports from other

units in the division recount prompt ammunition supply. Continuity of ammunition supply was present throughout the battle.

Responsiveness

Tactical commanders in the Army of Tennessee were, by all accounts, pleased with the ordnance operations by their logisticians. Responsiveness denotes the ability to adapt to unforeseen situations. Army of Tennessee ordnance officers and men performed several actions demonstrating their responsiveness. One of these was the shifting of support between divisions with no loss of operational capability. Lieutenant Barrett's ordnance train from Jackson's Brigade was transferred by Major General Cheatham to Cleburne's Division on 20 September. He and his ordnance train supplied Cleburne's Division as it came off the field that evening and the next morning returned to their original brigade.⁵⁸ They moved into another corps, supplied one of its divisions, and transferred back to their original headquarters. Not an insignificant accomplishment on a battlefield.

Supporting combat units unexpectedly is another example of the South's responsiveness. The 5th Georgia Cavalry received support from Lieutenant Fred Dallas, Deas' Brigade ordnance officer, on 19 September. They only required 500 rounds, but as an example of the control the Army of Tennessee maintained on its ammunition, the officer received permission from his division ordnance officer before he gave it to them.⁵⁹

As an example of a responsive system the ordnance officers in the Army of Tennessee regularly and freely expressed their satisfaction or mostly dissatisfaction with the ordnance products in their care.

Gorgas's reporting system seemed to invited comment from every level of command. Lieutenant Colonel Oladowski received reports from the corps ordnance officers and with those reports were those from the division and brigades.

A common complaint was the size of the Enfield rifled musket ammunition causing difficulty in loading and eventual choking.

Lieutenant Colonel James Barr, 10th Mississippi Infantry, described the frustrating, dangerous situation as follows:

My ammunition becoming exhausted, and the rifles so choked the men were compelled to force the balls home by hammering the ends of their ramrods against trees--reported these acts to Brig.Gen. Patton Anderson, he ordered me to hold my position until the expected reinforcements arrived. . . Formed my regiment and supplied them with cartridges; had guns washed and cleaned; stacked arms, and rested from the fatigues of the day, expecting to renew the battle on the morning of the 21st; but morning found the enemy gone and our cavalry in pursuit.⁶⁰

There are numerous reports of the weapons choking on the ammunition. Several ordnance officers offered solutions to the problem. Captain Charles Stemple, ordnance officer, Breckenridge's Division, suggested the ammunition could be much improved by making the ball slightly smaller to allow lubrication of the outside of the cartridge, the same way the English manufactured the Enfield cartridge.⁶¹ He went on to point out that in every case the choked ammunition was of Southern manufacture and that he never experienced English Enfield ammunition leading a rifle. Almost in an aside, he added that the battery commanders reported the Confederate friction primers are "perfectly worthless and unreliable." A different solution was reached for the same problem by Lieutenant John C. Harrison, acting ordnance officer, Walthall's Brigade. He remarked that his brigade was mostly armed with Enfields and that the .57 caliber ammunition was loose and never choked

the guns while the .58 caliber was found too large and soon choked the gun into uselessness.⁶² His simple solution was to issue .57 caliber ammunition to all the units with .58 caliber Enfields.

Major John Cheatham, chief of ordnance, Cheatham's Division, had a more scientific but labor intensive approach.⁶³ His first suggestion was that ordnance personnel carefully unload choked arms to see where the ammunition was manufactured and if the ball were too large to begin with, if they were sufficiently greased, or if the English system of using smaller balls with thick paper was better than the Confederate system of larger balls without paper. He continued his suggestion with the proposal that an officer cut into the trees around a battlefield to gage the relative penetrating power of the ammunition used by both sides. Cheatham thought such a study might uncover defects in manufacturing and show technical differences in the types of rounds. As difficult as the last suggestion may have been to implement, Cheatham's suggestion is strikingly similar to studies in ammunition performance testing during development for small arms today.

The main point to take away from all these comments on the ammunition operations is that the Confederate system was responsive to the needs of the soldiers. Some of their problems may have been beyond the capability of the system to solve, but the fact that such comments were not discouraged by the reporting system is a commendation to their attempt to be responsive.

Improvisation

The Confederate soldiers were masters of improvisation. Their entire army was something of an improvised force. Adapting to changing

situations and inventing, arranging, or fabricating what was needed out of what was at hand was a daily practice. The action at Chickamauga soon tested their skills in a manner they had not planned for.

Major John Cheatham showed an uncommon degree of improvisation in the Battle of Chickamauga. He had already shown anticipatory and continuity skills in how he organized the division's ammunition assets for the battle. His improvisation skills were tested on Saturday the 19th of September.⁶⁴ He took advantage of the provisional wagons returning from providing sustenance to the front lines to move captured arms from the field. Since he did not know how the outcome of the next day's battle, Cheatham got the captured arms as near to railroad transportation as he could. Fortune favored the South on Sunday and Cheatham reacted quickly. As soon as he realized the Confederate forces were driving the Union back, he ordered three empty wagons onto the battlefield on the west side of the creek to recover captured arms. The major obviously realized the importance of that part of the operation since he commented that he gave that part of the operation his personal attention. Cheatham also sent one of his ordnance officers back to the rear at the division hospital a mile east of the creek to receive the arms and ammunition as it went back. That officer's mission was to expedite the unloading and return of the wagons. Confederate forces were more successful than anyone planned for and at this point Cheatham took a rather large gamble. Major Cheatham ordered the unloading of Confederate arms onto the field to use the wagons to move captured arms to the rear. If the Union forces had driven the Confederates back Cheatham's Division's ammunition would have been immobile. The major's gamble won out and he moved captured ammunition to the rear until

Lieutenant General Polk ordered the Ordnance train moved to Red House, some ten miles lower down by the creek. The performance demonstrated by John Cheatham, his ordnance officers, ordnance sergeants, and details was outstanding. Major Cheatham had one more suggestion worthy of comment. He related the time before an ammunition resupply from the infantry point of view in his statement, "When a regiment that may be engaged with the enemy exhausts its ammunition, moments become hours in importance while awaiting a fresh supply." Cheatham offered the suggestion that the ordnance trains fly conspicuous flags to mark their location on the field. He contended that such a device would lessen the confusion and guide messengers dispatched to get the wagons. No records indicate if Cheatham's suggestion about flagging the ordnance trains was implemented or not. It certainly seemed easy to do and would probably have worked. Ordnance wagons were marked with the word "ammunition" painted on the sides in large letters, but Cheatham's idea would have made them even easier to find through the "fog" of war.

CONCLUSION

Drawing conclusions from incomplete reports is a difficult proposition. In the case of the Army of the Cumberland a complete picture of the ordnance operation during the Battle of Chickamauga is not possible. Captain Horace Porter submitted the following report:

Sir: I have the honor to submit the following report of ordnance and ordnance stores expended, captured, and lost in the battle of Chickamauga, September 19 and 20, 1863;

| | |
|--|-------|
| Pieces of artillery captured | 36 |
| Artillery carriages captured | 36 |
| Cassions captured | 22 |
| Limbers captured | 20 |
| Rifled muskets lost and captured | 8,008 |
| Spencer rifles lost and captured | 70 |

| | |
|--|-----------|
| Carbines lost and captured | 350 |
| Colt's revolving rifles lost and captured | 22 |
| Colt's revolving pistols lost and captured. | 410 |
| Cavalry sabers lost and captured. | 305 |
| Sets of infantry accouterments last and captured. | 5,834 |
| Rounds of artillery ammunition expended in firing. | 7,325 |
| Rounds of artillery ammunition lost and captured. | 2,550 |
| Rounds of infantry ammunition expended in firing. | 2,529,952 |
| Rounds of infantry ammunition lost and captured. | 150,280 |
| Rounds of cavalry ammunition expended in firing. | 121,000 |

Very respectfully, your obedient servant

HORACE PORTER
 Captain of Ordnance, U.S. Army⁶⁵

If the performance of the ordnance operations of the Army of the Cumberland were judged by this single report they would fail. However we saw earlier when one examines the available evidence the army did many things correctly. Rosecrans correctly anticipated the amount and type of ammunition required for the campaign. He built sufficient forces to operate on long logistical lines of communication that crossed major obstacles. Rosecrans had officers under his command that exercised a high degree of responsiveness within their own influence. Some improvised ways to provide ammunition support under periods of extreme stress and exercised good judgement on when to take action on their own volition.

The failing of the ammunition support system for the Army of the Cumberland was one of continuity. The continuous support combat forces require in a high usage environment simply was not present on the battlefield. One unfortunate incident at a critical time in the battle contributed to their defeat. When the "unauthorized person" sent the 14th Corps ordnance train off the field, it contributed to an already poor ammunition situation. The purpose of higher level ammunition support is to supplement the lower organizations in times of need.

Divisions in the 14th Corps were in desperate need of ammunition and none was coming. Decisions on the field established conditions that further separated tactical units from their ordnance trains and reinforced the error. Better command and control of the ordnance units may have prevented unauthorized actions. There are no reports of an investigation surrounding the action of the 14th Corps ordnance trains. If it was investigated the results are not included in the Official Records. The support command structure in the Army of the Cumberland was not equal to the Army of Tennessee's.

The Army of Tennessee under General Bragg had this report at the end of the battle:

We lost some artillery the first day, but recovered all before the close of the action. Thirty-six pieces taken from the enemy have so far been reported and secured. We have also collected about 15,000 stand of small-arms over and above what were left on the field from our casualties, and have 25 stand of colors and guidons, and about 7000 prisoners.⁶⁶

Official records provide a much more complete picture of the ordnance operations for the Army of Tennessee. The picture provided by these records is one of an army that operated by the logistical imperatives as we define them today. The commanders and officers correctly anticipated the requirements of the army and organized themselves to meet them. A strict system of command and control for the ordnance operation was established. The ordnance officers in the brigades and divisions may have worked for those brigade and division commanders, but it is clear they responded to direction from an ordnance chain of command that closely monitored their activities and supported their actions.

They task-organized the ordnance trains and many times placed them under more direct control of senior field grade officers. At Chickamauga the direct control over the operations at the division level worked. Support to the combat units was present in almost all occasions and even flexible enough to allow support between corps without disrupting the operation.

The infantry was quick to improve its own armament situation as judged by Bate's Brigade, Stewart's Division:

My brigade went into the fight with muskets in the hands of one-third of the men, but after the first charge Saturday evening every man was supplied with a good Enfield rifle and ammunition to suit, which was used with effect on their original owners the next day. . . . Besides arming themselves with Enfield rifles, a detail from my command, under the supervision of my ordnance officer, James E. Rice, gathered upon the field and conveyed to the ordnance train about 2,000 efficient guns. The pieces captured by Colonel Tyler and those in which Colonel Jones participated in the capture were taken to the rear and turned over to proper officers.⁶⁷

Perhaps the best compliment to the ordnance operations and their ability to capitalize on a situation is from Brigadier General B. R. Johnson, Johnson's Division:

To my efficient ordnance officer (Lieut. James B. Lake) I feel that a special acknowledgement is due, as well for all his faithful services past as for the prompt supplies which he furnished my whole division from a brigade ordnance train, and yet at the close of the battle exhibiting greater abundance of stores on hand than at its commencement.⁶⁸

Finally, the Army of Tennessee displayed a characteristic common throughout the Confederacy, a knack for improvisation. Certainly the strangest of doctrinal imperatives, the Army of Tennessee despite its control measures and reporting procedures did not stifle improvisation. Its ordnance officers suggested common sense solutions to the problems they experienced. The South's

strategic capability to respond to these challenges may have been limited but they obviously tried. Grading the Army of Tennessee's ammunition operation performance by today's logistical imperatives should give them high marks.

Endnotes

¹U.S. Army, FM 9-6, Munitions Support in Theater Operations (Washington: Department of the Army, 1989), 1-1.

²U.S. Army. FM 100-5, Field Service Regulations--Operations (Washington: Department of the Army, 1993), 12-3.

³The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part I - Reports, 62.

⁴Ibid., 62.

⁵Ibid., 281.

⁶Ibid., 329.

⁷Ibid., 344.

⁸Ibid., 359.

⁹Ibid., 344.

¹⁰Ibid., 344.

¹¹Ibid., 381.

¹²Ibid., 385.

¹³Ibid., 389.

¹⁴Ibid., 141.

¹⁵Ibid., 253.

¹⁶U.S. Army. FM 100-5, Field Service Regulations--Operations, (Washington: Department of the Army, 1993), 12-4.

¹⁷The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part I - Reports, 253.

¹⁸Ibid., 253.

¹⁹Ibid., 288.

²⁰Ibid., 316.

²¹Ibid., 317.

²²Ibid., 430.

²³Ibid., 416.

²⁴Ibid., 424.

²⁵Ibid., 403.

²⁶Ibid., 442.

²⁷Ibid., 436.

²⁸Ibid., 253.

²⁹Ibid., 430.

³⁰Ibid., 329.

³¹Ibid., 344.

³²Ibid., 406.

³³The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part II - Reports, 86.

³⁴Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Col Wright, Comdg C. S. Arsenal, Atlanta, GA, 13 August 1863, Ordnance Office, Army of Tennessee (Ch IV, Vol 143), RG 109, National Archives, Washington, DC. (Cited hereafter as NA.)

³⁵Telegram, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Col Wright, Comdg C. S. Arsenal, Atlanta, GA, 13 August 1863, NA.

³⁶Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to General Mackall, 11 August 1863, NA.

³⁷Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Capt J. P. Girardie, Comdg Augusta Arsenal, 5 Sep 1863, NA.

³⁸Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Col Gorgas, Chief of Ordnance, 14 August 1863, NA.

³⁹Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Col Gorgas, Chief of C. S. Ordnance, 31 August 1863, NA.

⁴⁰Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Col Wright, Comdg, Atlanta Arsenal, 31 August 1863, NA.

⁴¹The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part II - Reports, 81.

⁴²Ibid., 86.

⁴³Ibid., 332.

⁴⁴Ibid., 86.

⁴⁵Ibid., 247.

⁴⁶Ibid., 245.

⁴⁷The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part IV - Correspondence, 700.

⁴⁸Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Major Duxbury, Chief of Ordnance, Hill's Corps, 16 August 1863, NA.

⁴⁹The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part II - Reports, 371.

⁵⁰Ibid., 276.

⁵¹Ibid., 109.

⁵²Ibid., 121.

⁵³Ibid., 179.

⁵⁴Ibid., 177.

⁵⁵Ibid., 183.

⁵⁶Ibid., 175.

⁵⁷Ibid., 114.

⁵⁸Ibid., 86.

⁵⁹Ibid., 332.

⁶⁰Ibid., 332.

⁶¹Ibid., 202.

⁶²Ibid., 276.

⁶³Ibid., 81.

⁶⁴Ibid., 81.

⁶⁵The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part I - Reports, 233.

⁶⁶The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part II - Reports, 24.

⁶⁷Ibid., 386.

⁶⁸Ibid., 466.

CHAPTER FIVE

CONCLUSION

Today's AirLand battlefield is characterized by intense, highly lethal, nonlinear operations creating an unprecedented demand for ammunition resources.¹ Ammunition units are required to push high tonnages of ammunition forward on the battlefield while simultaneously maintaining minimum essential stocks throughout the distribution system to retain maximum flexibility and mobility for future combat operations. The ammunition support system working for the operational and tactical commanders is supported by a complex strategic ammunition supply and production system providing ammunition and ordnance items to armies in the field. Ordnance support systems used by both sides in the U.S. Civil War were equally complex for their time.

Almost the exact words could be used to describe the ammunition support requirements for the Civil War. Substitute "civil war" for "AirLand Battle" and almost any civil war logistician would agree there was an unprecedented demand for ammunition by armies in the field. There was also the greatest variety of technical advances in ordnance and related war fighting systems that the world had seen in this first "modern war." The Civil War marked an era in the industrialization of war fighting. The use of steam transportation by rail and sea, rifled ordnance, fused artillery shells, screw propellers, armored ships, mines, hand grenades, and submarines are a few examples of developments

fielded during the war. There was an "evolution" of firearms unlike any other period of history.² Smoothbore flintlock muskets were quickly replaced by breech loading single-shot rifled arms, firing minie projectiles, which were eventually largely augmented by rapid firing, magazine-fed rifles. Artillery innovations focused on accuracy and versatility. Rifled artillery pieces such as the three inch Rodman became common during the war. The most common field artillery piece was the twelve pounder gun-howitzer (Napoleon). Conceived as a multipurpose weapon, it replaced less versatile guns and howitzers on both sides of the conflict. The strategic capability of the Union and the Confederacy to produce and field these type weapons influenced the Chickamauga Campaign.

By almost any material measure the North enjoyed a greater advantage, including ordnance production. Most of the arms producing facilities were located in northern states. This included powder mills and other supporting industries. The capture of the Harper's Ferry facility in Virginia was a great blow to Northern production, but even that loss was soon compensated for by privately contracted arms producers and foreign purchases. Nineteen different types of carbines and eight types of advanced rifles were bought from northern contractors and sent to the troops.³ Arms from abroad came from several European countries with the most common being the British Enfield rifled musket. Over 400,000 Enfield rifles were purchased by the Union and issued to its armies. Northern logisticians may have had a cold start on ordnance production but the North's industrial base soon overcame any shortcomings and continued throughout the war to provide a tremendous strategic production capability.

The Confederacy was not similarly blessed. Its strategic ordnance capability in no way matched the North's. Southern powder production in its one large mill and five small mills suffers in comparison with the fifteen powder producing mills in the Union.⁴ There were few arms and ammunition production facilities in existence in the southern states at the start of the war. The Confederacy confiscated federal arsenals in different locations, but these often obsolete arms did not nearly meet Southern requirements. The capture of Harper's Ferry and the subsequent removal and use of the machinery to manufacture arms for the South significantly increased its ability to make modern rifled arms. The machinery was a boost to their wartime arms production. Like the Union, the South quickly sent buyers overseas to purchase arms and ammunition from European countries. Southerners quickly became adept at copying captured arms and manufacturing copies of European weapons. However, their skills and resources were limited when it came to the manufacturing of repeating weapons. Confederate soldiers acquired many of their repeating weapons in engagements with the North. Southern artillery production generally reflected its shoulder-arms capability. It manufactured or purchased artillery pieces that, while not obsolete, were not as modern as their opponents to the North. They had fewer rifled artillery pieces than the North.

The armies engaged in battle at Chickamauga were the products of their strategic ordnance production capabilities. The Army of the Cumberland had a mix of shoulder-fired weapons. Only one regiment was armed exclusively with smoothbore arms. Most of the others had a mix of various types of .58 caliber rifled muskets. A few regiments were armed with repeating rifles like the Spencer, but even those still had numbers

of soldiers armed with rifled muskets. Modern arms provided superior firepower but logistically their unique ammunition posed challenges. Only one regiment at Chickamauga was armed with Colt revolving rifles, the 21st Ohio. The Colt was reputed to be a fine weapon, but the 21st found themselves out of ammunition during the battle, and when some was brought it did not fit their rifles. Artillery batteries of the Army of the Cumberland were fairly modern as well. Over 50 percent of their artillery pieces were rifled cannon. Of the remaining number, the majority were the effective 12 pounder Napoleons. The Army of the Cumberland should be considered well armed in shoulder-fired and artillery.

The Army of Tennessee was also a product of its strategic capability. Its armaments reflected the production and procurement potential of the Confederacy. Soldiers in this Southern army were not as well armed as their opponents. The ratio of smoothbore muskets to rifled arms was one-to-three at the start of the campaign. They had few repeating rifles and many had obsolete weapons. Fortunately, their ordnance status was much improved thanks to captured arms from the Army of the Cumberland. Lieutenant Colonel Oladowski reported in a letter to Colonel Wright at the Atlanta Arsenal after the battle, "Nearly all smooth bore muskets were exchanged by men on the field is advisable to prepare only Enfield ammunition."⁵ Included in the captured arms were 70 Spencer rifles, 22 Colt revolving rifles, and 350 carbines to give a boost to Southern modernization.⁶ Artillery batteries in the Army of Tennessee showed a lack of modernization. The percentage of rifled artillery was only nineteen out of the 145 pieces available, but most of the remainder were Napoleons. The artillery

status of the Confederate troops improved after the battle as well with the capture of thirty-six pieces.⁷

Key differences from the ordnance perspective in the Chickamauga Campaign are found in examining the operations of the ammunition supply operations on 19 and 20 September 1863. Report after report from the Army of the Cumberland's infantry describe a bleak ammunition situation. Command and control of ordnance assets was poor, especially in 14th Corps where its ordnance train was sent to the rear by an unauthorized person. Other individual acts of heroism and initiative by logisticians failed to compensate for that single event. Most were concerned with preventing the capture of what ordnance assets they could.

A difference in the ordnance organization of the two armies was the ranks of the ordnance officers in key positions. Lieutenant Colonel Oladowski, as the chief of ordnance for the Army of Tennessee, probably had more authority than the captain doing the same job in the Army of the Cumberland. The same pattern continues down the chain of organizations. Lieutenants are division ordnance chiefs in the North while majors hold these positions in the Confederacy. I surmise from the difference in rank structure that the North's officers generally had less authority and experience than their counterparts in the South.

The tactical error that allowed Longstreet to move his men through a gap in the lines was critical, but the situation was worse because of the lack of Union ammunition on the battlefield. Regiments that could have contributed to the continued defense were out of ammunition, broke and did not regroup. Men were often forced to search the battlefield's dead and wounded to find cartridges to continue the

fight. Soldiers shared cartridges when they could, but in at least one case a regiment, armed with a unique caliber, was decimated because it could not use the meager supply of ammunition available. I have been unable to determine if the campaign caused the Union regiments to use more ammunition than usual. Northern infantry were in defensive positions for most of the battle. A feature of the Civil War is that attacking regiments, moving toward a defensive line, generally used less ammunition than the defending force. The reason is that the attacking force could not reload and move at the same time. Defending troops could reload and fire without pause. Since the Union was defending most of the time at Chickamauga, their ammunition supply system was under considerable stress. The most critical failure of the ammunition support system for the Army of the Cumberland was a lack of continuity. I believe the reason for the lack of continuity was the less structured, less experienced ordnance support system. It is clear the ordnance supply system contributed to the Union defeat.

Ordnance operations for the Army of Tennessee had a much easier time in this campaign. Their success stems from several sources. They had a better command and control system that started with their Ordnance Bureau in Richmond. Colonel Gorgas required regular reports on ordnance operations and carried on extensive communications with his ordnance officers in the field. This tight command and control structure was also present in the Army of Tennessee. Lieutenant Colonel Oladowski kept close tabs on the corps and division ordnance operations.

Command and control was not the only area in which the Army of Tennessee ordnance officers did well. Within the army are examples of task organization for the campaign, the flexibility to shift ammunition

support where it was needed between corps, and examples of ordnance officers exploiting the tactical success to better their logistical status. Bragg's ordnance officers demonstrated all the characteristics of the logistical imperatives. Still the key to their ammunition success was continuity of operations. There are almost no reports of combat units running out of ammunition and having to disengage. On the contrary, most tactical commanders praised their ordnance officers and their details for their performance of duty.

This study of the role of ammunition logistics at the Chickamauga Campaign holds lessons for today's military. This thesis concludes there are several lessons and will highlight three of them.

The first lesson is that the logistical imperatives in today's doctrine are a valid measuring tool to examine logistical operations in past battles and campaigns. Examining the campaign in terms of the imperatives of *anticipation, integration, continuity, responsiveness, and improvisation* showed how Civil War ordnance officers and men strived to perform their mission under battlefield conditions.

The second lesson is to plan for disaster. At the operational level the Army of the Cumberland wisely sent its nonessential logistical assets to the rear before the battle. This act gave them some much needed flexibility on a poor road network and some increase in mobility. It saved most of their general supplies, but in the end they failed to deliver the ammunition to the line when it was needed.

The third lesson is to plan for success. Confederate ordnance officers were not ready to reap the fruits of their victory. Their capture of arms and the subsequent removal of many thousands from the battlefield was more a credit to their improvisational skills than their

planning. I say this not to reproach their actions, but to point out they could have recovered even more ordnance had success been a planning consideration. Failing to plan for success is not unique in our history. Our own modern army committed a similar error in the Gulf War when we failed to plan for the rapid capitulation of Iraq's military.

The Chickamauga Campaign challenged ordnance soldiers on both sides of the conflict. They were forced to deal with evolving technologies that complicated their jobs in the scope and variety of ordnance support needed on the battlefields. These emerging ordnance technologies depended on men, mules, and wagons to serve the line. It is a credit to their efforts that they mostly succeeded in providing support to the war fighters. Chickamauga still holds lessons for today's logisticians and tacticians alike.

Endnotes

¹U.S. Army, FM 9-6, Munitions Support in Theater of Operations (Washington: Department of the Army, 1989), 1-1.

²Claud E. Fuller, The Rifled Musket (Harrisburg, PA: The Stackpole Company, 1958), 1.

³Ibid., 1.

⁴Berkley R. Lewis, Notes On Ammunition of the American Civil War (Richmond, VA: The William Byrd Press, Inc., 1959), 5.

⁵Letter, Lieut-Col Oladowski, Chief of Ordnance, Army of Tennessee to Col Wright, Comdg C.S. Arsenal, Atlanta GA, 25 September 1863, Ordnance Office, Army of Tennessee (Ch IV, Vol 143), RG 109, National Archives, Washington, DC.

⁶The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (Washington: Government Printing Office, 1880-1901), series I, volume XXX, part I - Reports, 233.

⁷Ibid., 233.

APPENDIX A

ARMY OF THE CUMBERLAND

ORDER OF BATTLE AND ORDNANCE TYPES

SEPTEMBER 1863

This was compiled from the following source: The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, Series I, Vol XXX, Part I--Reports.

The number of rifles listed herein are from two sources within the Official Records:

1. Ordnance reports noting numbers of weapons.
2. Official strength reports that differentiate between officers and soldiers. Soldiers are assumed to be armed with shoulder-fired weapons. Officers are assumed to be armed with pistols and so not included.

Close examination of these tables reveals weapon quantities that do not match strength reports. In some cases, records only show numbers of weapons in the tens or less for entire companies. Discrepancies in reporting and loss of complete data, especially for the Army of Tennessee, accounts for the inconsistencies. These records do accurately serve to show the numerous mixes of weapons ordnance officers had to support throughout the Chickamauga Campaign.

MAJOR GENERAL WILLIAM S. ROSECRANS

| General Headquarters | | |
|---------------------------|---|--------|
| Unit | Weapon Type(s) | Number |
| 1st Bn Ohio Sharpshooters | | |
| 10th Ohio Infantry | Enfield rifle musket .577 cal. hereafter simply "Enfield" | |
| 15th Pennsylvania Cavalry | Burnside carbine | |

XIV ARMY CORPS, MAJOR GENERAL GEORGE THOMAS

| 1st Division, Brigadier General Absalom Baird | | |
|---|--|-----------------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 38th Indiana | Springfield Enfield | 95 223 |
| 2nd Ohio | Springfield Enfield | 132 285 |
| 33d Ohio | Springfield Enfield Rifled musket alt to per. cap .69 cal | 151 209 4 |
| 94th Ohio | Springfield Enfield | 39 238 |
| 10th Wisconsin | Austrian/Prussian/ Saxon .71 cal. | 70 |
| 2d Brigade | | |
| 24th Illinois | Springfield Enfield | |
| 79th Pennsylvania | Smoothbore muskets .69 cal | 246 |
| 1st Wisconsin | Springfield Enfield Smoothbore .69 | 6 4 71 |
| 21st Wisconsin | Springfield Enfield Aust./Prus./Saxon | 78 74 29 |
| 3d Brigade | | |
| 15th US, 1st Bn | | |
| 16th US, 1st Bn | | |
| 18th US, 1st Bn | | |
| 18th US, 2d Bn | | |
| 19th US, 2d Bn | | |
| Artillery | | |

| 1st Division, Brigadier General Absalom Baird | | |
|---|-----------------|--------|
| Unit | Weapon Type(s) | Number |
| Indiana Light, 4th Battery (2d Bde) | Napoleon | 2 |
| | 12 pdr howitzer | 2 |
| | 6 pdr rifle | 2 |
| 1st Michigan Light, Battery A (1st Bde) | 10 Pdr Parrot | 6 |
| 5th US, Battery H, (3d Bde) | Napoleon | 4 |
| | 10 pdr Parrot | 2 |

| 2d Division, Major General James S. Negley | | |
|--|-------------------|--------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 104th Illinois | Enfield | |
| 42d Indiana | Enfield | |
| 88th Indiana | Enfield | 348 |
| 15th Kentucky | Enfield | 319 |
| | Springfield | 16 |
| 2d Brigade | | |
| 19th Illinois | Springfield | 372 |
| | Enfield | 4 |
| 11th Michigan | Springfield | 367 |
| 18th Ohio | Enfield | 365 |
| 3d Brigade | | |
| 37th Indiana | Springfield | 85 |
| | Enfield | 327 |
| 21th Ohio | Colt rev. rifle | 517 |
| 74th Ohio | Enfield | 264 |
| | Aust./Prus./Saxon | 2 |
| 78th Pennsylvania | Enfield | 456 |
| | Springfield | 79 |
| Artillery | | |
| Illinois Light, Bridges' Battery (1st Bde) | Napoleon | 2 |
| | 3" ord rifle | 4 |

| 2d Division, Major General James S. Negley | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| 1st Ohio Light, Battery G (3d Bde) | Napoleon | 4 |
| | 3" ord rifle | 2 |
| 1st Ohio Light, Battery M (2d Bde) | 3" ord rifle | 2 |
| | 6 Pdr | 4 |

| 3d Division, Brigadier General John M. Brannan | | |
|--|---|--------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 82d Indiana | Aust. .577 cal | 86 |
| | Springfield | 9 |
| | Enfield | 5 |
| 17th Ohio | Springfield | 471 |
| | Enfield | 4 |
| | Austrian .54 cal | 17 |
| 31st Ohio | Enfield | 254 |
| | Springfield | 199 |
| 38th Ohio | Springfield | 18 |
| | Enfield | 447 |
| 2d Brigade | | |
| 10th Indiana | Enfield | 558 |
| 74th Indiana | Aust./Prus./Saxon | 70 |
| | Enfield | 79 |
| | Springfield | 132 |
| 4th Kentucky | Enfield | 358 |
| | Smoothbore .69 cal | 6 |
| 10th Kentucky | Enfield | 432 |
| | Springfield | 8 |
| 14th Ohio | Springfield | 603 |
| | Rifled musket alt to per.cap .69 cal | 7 |
| 3d Brigade | | |
| 87th Indiana | Springfield | 165 |
| | Enfield | 2 |

| 3d Division, Brigadier General John M. Brannan | | |
|--|--|--------|
| Unit | Weapon Type(s) | Number |
| 2d Michigan | Spencer rifles & carbines; Colt revolving rifle; Springfield | |
| 9th Ohio | Springfield | 323 |
| | Model 1842 .58 cal | 309 |
| | Enfield | 18 |
| | Smoothbore .69 cal | 7 |
| 35th Ohio | Springfield | 419 |
| Artillery | | |
| 1st Michigan Light, Battery D (1st Bde) | 12 pdr howitzer | 2 |
| | 10 pdr Parrot | 2 |
| 1st Ohio Light, Battery C (2d Bde) | Napoleon | 2 |
| | 6 pdr rifle | 4 |
| 4th US, Battery I (3d Bde) | Napoleon | 4 |

| 4th Division, Major General Joseph J. Reynolds | | |
|--|------------------|--------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 92d Illinois | Enfield | 280 |
| | Spencers | 174 |
| 98th Illinois | Spencers | 354 |
| | Colt Rev. Rifles | 9 |
| 123d Illinois | Spencers | 262 |
| 17th Indiana | Spencers | |
| | Springfield | 227 |
| 72d Indiana | Spencers | 127 |
| | Enfield | 43 |
| | Springfield | 38 |
| 2d Brigade | | |
| 68th Indiana | Enfield | 390 |
| | Springfield | 1 |
| 75th Indiana | Springfield | 508 |

| 4th Division, Major General Joseph J. Reynolds | | |
|--|---|-----------|
| Unit | Weapon Type | Number |
| 101st Indiana | Springfield Belgian or Vincennes .69 cal | 306 1 |
| 105th Ohio | Springfield Enfield | 326 4 |
| 3d Brigade | | |
| 18th Kentucky | Austrian .54 cal Enfield | 6 240 |
| 11th Ohio | Springfield Rifle musket alt. to per. cap .69 cal | 366 1 |
| 36th Ohio | Enfield | 529 |
| 92d Ohio | Enfield Springfield | 56 406 |
| Artillery | | |
| Indiana Light, 18th Battery (1st Bde) | 12 pdr mtn. how. 3" ord rifle | 4 6 |
| Indiana Light, 19th Battery (2d Bde) | Napoleon 3" ord rifle | 4 2 |
| Indiana Light, 21st Battery (3d Bde) | Napoleon | 6 |

XX ARMY CORPS, MAJOR GENERAL ALEXANDER M. MCCOOK

| 1st Division, Brigadier General Jefferson C. Davis | | |
|--|--|-----------------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 59th Illinois | M1842 .69 cal Aust./Prus./Saxon Smoothbore .69 cal | 301 3 5 |
| 74th Illinois | Enfield | 236 |
| 75th Illinois | Enfield Springfield Austrian .69 cal | 150 16 51 |

| 1st Division, Brigadier General Jefferson C. Davis | | |
|--|--|-----------------|
| Unit | Weapon Type | Number |
| 22d Indiana | Enfield | 310 |
| Wisconsin Light Artillery, 5th Battery | | |
| 2d Brigade | | |
| 21st Illinois | Enfield Springfield | 152 4 |
| 38th Illinois | Enfield Springfield | 358 8 |
| 81st Indiana | Austrian .577 Enfield Springfield | 192 35 10 |
| 101st Ohio | Springfield | 227 |
| Minnesota Light Artillery, 2d Battery | Napoleon 10 pdr Parrot | 4 2 |
| 3d Brigade | | |
| 25th Illinois | Enfield Springfield Model 1842 .58 cal | 313 61 10 |
| 35th Illinois | Springfield Enfield Austrian Model 1842 .69 cal | 82 299 12 |
| 8th Kansas | Springfield | |
| 15th Wisconsin | French .58 cal Enfield Springfield | 35 133 8 |
| Wisconsin Light Artillery, 8th Battery | Napoleon 3" ord rifle | 2 4 |

| 2d Division, Brigadier General Richard W. Johnson | | |
|---|------------------------|-----------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 89th Illinois | Springfield Enfield | 384 18 |

| 2d Division, Brigadier General Richard W. Johnson | | |
|---|---|--------|
| Unit | Weapon Type(s) | Number |
| 32d Indiana | Enfield | 259 |
| | Springfield | 33 |
| 39th Indiana | Enfield | 289 |
| 15th Ohio | Enfield | 383 |
| 49th Ohio | Enfield | 434 |
| | Rifled musket alt. to per. cap .69 cal | 8 |
| 1st Ohio Light Artillery, Battery A | Napoleon | 2 |
| | 6 pdr rifle | 4 |
| 2d Brigade | | |
| 79th Illinois | Enfield | 94 |
| | Springfield | 124 |
| | Austrian .69 cal | 14 |
| 29th Indiana | Enfield | 180 |
| | Springfield | 9 |
| 30th Indiana | Enfield | 231 |
| | Austrian .54 cal | 19 |
| | Springfield | 74 |
| 77th Pennsylvania | Enfield | 96 |
| | French .577 cal | 14 |
| | French .58 cal | 62 |
| | Springfield | 35 |
| Ohio Light Artillery, 20th Battery | Napoleon | 2 |
| | 3" ord rifle | 4 |
| 3d Brigade | | |
| 6th Indiana | Enfield | 298 |
| | Springfield | 97 |
| 5th Kentucky | Enfield | 285 |
| | Springfield | 3 |
| | Austrian .54 cal | 9 |
| | Dresden .58 cal | 4 |
| | | 6 |
| 1st Ohio | Enfield | 344 |
| | Springfield | 32 |
| | Austrian .58 cal | 9 |

| 2d Division, Brigadier General Richard W. Johnson | | |
|---|-----------------|--------|
| Unit | Weapon Type(s) | Number |
| 93d Ohio | Springfield | 318 |
| | Enfield | 15 |
| | Belguim .58 cal | 4 |
| Indiana Light Artillery, 5th Battery | Napoleon | 2 |
| | 6 pdr rifle | 4 |

| 3d Division, Major General Philip H. Sheridan | | |
|---|-------------------------------|--------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 36th Illinois | Springfield | 136 |
| | Enfield | 240 |
| 88th Illinois | Enfield | 41 |
| | Rifle musket .69 cal | 275 |
| 21st Michigan | Austrian .54 cal | 166 |
| | Enfield | 1 |
| | Colt Rev. rifle | 17 |
| 24th Wisconsin | Enfield | |
| Indiana Light Artillery, 11th Battery | Napoleon | 4 |
| | 3" ord rifle | 2 |
| 2d Brigade | | |
| 44th Illinois | Dresden .58 cal | 188 |
| | Enfield | 15 |
| | Springfield | 3 |
| 73d Illinois | Enfield | 178 |
| | English smoothbore .69 cal | 8 |
| 2d Missouri | Bel./Fr. .69 cal | 175 |
| | Enfield | 59 |
| 15th Missouri | Enfield | 80 |
| | Belgium or French .69 cal | 278 |
| 1st Missouri Light Artillery, Battery G | | |
| 3d Brigade | | |

| 3d Division, Major General Philip H. Sheridan | | |
|---|------------------|--------|
| Unit | Weapon Type | Number |
| 22d Illinois | Enfield | 296 |
| | Springfield | 68 |
| | Sharps .52 cal | 15 |
| 27th Illinois | Enfield | 384 |
| | Enfield rifle | 43 |
| | Sharps .52 cal | 6 |
| 42d Illinois | Sharps .52 cal | 12 |
| | Enfield | 43 |
| | M1840/45 .58 cal | 335 |
| 51st Illinois | Austrian .54 cal | 87 |
| | Enfield | 1 |
| | Colt Rev. rifle | 5 |
| | Springfield | 9 |
| 1st Illinois Light Artillery, Battery C | 12 pdr howitzer | 2 |
| | 3" ord rifle | 4 |

XXI ARMY CORPS, MAJOR GENERAL THOMAS L. CRITTENDEN

| 1st Division, Brigadier General Thomas J. Wood | | |
|--|--------------------------------------|--------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 100th Illinois | Enfield | 209 |
| | Springfield | 22 |
| | Austrian .54 cal | 11 |
| 58th Indiana | Enfield | 364 |
| | Rifle musket alt. to per. cap .69 | 4 |
| 13th Michigan | Springfield | 199 |
| | Enfield | 67 |
| 26th Ohio | Enfield | 319 |
| | Springfield | 10 |
| 2d Brigade | | |
| 15th Indiana | Aust./Bel./French .71 cal | 4 |
| | Enfield | 60 |
| | Springfield | 250 |
| 40th Indiana | Enfield | 376 |

| 1st Division, Brigadier General Thomas J. Wood | | |
|--|-------------------------------------|------------|
| Unit | Weapon Type | Number |
| 57th Indiana | Enfield Springfield | 339 4 |
| 97th Ohio | Springfield | 305 |
| 3d Brigade | | |
| 3d Kentucky | Enfield | 362 |
| 64th Ohio | Enfield Springfield | 110 297 |
| 65th Ohio | Enfield Springfield | 128 215 |
| 125th Ohio | Springfield | 321 |
| Artillery | | |
| Indiana Light, 8th Battery (1st Bde) | 6 pdr smoothbore 12 pdr howitzer | 4 2 |
| Indiana Light, 10th Battery (2d Bde) | | |
| Ohio Light, 6th Battery (3d Bde) | Napoleon 10 pdr Parrot | 2 4 |

| 2d Division, Major General John M. Palmer | | |
|---|--|----------------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 31st Indiana | Springfield Austrian .58 cal Enfield | 3 17 340 |
| 1st Kentucky (5 companies detached as wagon guards) | Austrian .54 cal | 238 |
| 2d Kentucky | Enfield Springfield | 309 42 |
| 90th Ohio | Enfield | 431 |
| 2d Brigade | | |
| 9th Indiana | Springfield | 408 |

| 2d Division, Major General John M. Palmer | | |
|---|--|------------------|
| Unit | Weapon Type(s) | Number |
| 6th Kentucky | Enfield | 385 |
| 41st Ohio | Springfield Rifled musket alt. to per. cap .69 cal | 333 12 |
| 124th Ohio | Springfield | 281 |
| 3d Brigade | | |
| 84th Illinois | Enfield | 357 |
| 36th Indiana | Enfield | 419 |
| 23d Kentucky | Austrian .54 cal Enfield | 241 22 |
| 6th Ohio | Enfield Springfield French .58 cal | 270 104 19 |
| 24th Ohio | Springfield Enfield | 137 107 |
| Artillery | | |
| 1st Ohio Light, Battery B (1st Bde) | 6 pdr smoothbore 6 pdr rifle | 2 4 |
| 1st Ohio Light, Battery F (2d Bde) | Napoleon 3" ord rifle | 4 2 |
| 4th US, Battery H (3d Bde) | 12 pdr howitzer | 4 |
| 4th US, Battery M (3d Bde) | Napoleon 12 pdr howitzer | 4 2 |

| 3d Division, Brigadier General Horatio P. Van Cleve | | |
|---|---|---------------------------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 79th Indiana | Enfield | 348 |
| 9th Kentucky | Enfield Springfield Austrian .577 cal Austrian .58 cal Smoothbore .69 cal | 226 4 11 18 3 |

| 3d Division, Brigadier General Horatio P. Van Cleve | | |
|---|---|----------------------|
| Unit | Weapon Type | Number |
| 17th Kentucky | Enfield | 511 |
| 19th Ohio | Enfield Springfield | 398 10 |
| 2d Brigade | | |
| 44th Indiana | Enfield Springfield | 265 10 |
| 86th Indiana | Enfield | 219 |
| 13th Ohio | Enfield Springfield Rifled musket alt. to per. cap .69 cal | 309 41 4 |
| 59th Ohio | Enfield Springfield Rifled musket alt. to per. cap .69 cal | 392 25 15 |
| 3d Brigade | | |
| 35th Indiana | Enfield Springfield | 303 48 |
| 8th Kentucky | Enfield Springfield | 190 80 |
| 21st Kentucky | Enfield Enfield rifle Springfield | 242 35 36 |
| 51st Ohio | Enfield Austrian .58 cal Springfield Rifled musket alt. to per. cap .69 cal | 319 7 34 11 |
| 99th Ohio | Enfield | 356 |
| Artillery | | |
| Indiana Light, 7th Battery | Napoleon 10 pdr Parrot | 2 4 |
| Pennsylvania Light, 26th Battery | | |
| Wisconsin Light, 3d Battery | 12 pdr howitzer 10 pdr Parrot | 2 4 |

RESERVE CORPS, MAJOR GENERAL GORDON GRANGER

| 1st Division, Brigadier General James B. Steedman | | |
|---|-------------------|--------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 96th Illinois | Enfield | 515 |
| 115th Illinois | Springfield | 15 |
| | Enfield | 13 |
| | Model 1841 | 303 |
| 84th Indiana | Enfield | 504 |
| | Springfield | 64 |
| 22d Michigan | Austrian .54 cal | 151 |
| 40th Ohio | Springfield | 445 |
| | Enfield | 159 |
| 89th Ohio | Springfield | 459 |
| Ohio Light Artillery 18th Battery | 3" ord rifle | 6 |
| 2d Brigade | | |
| 78th Illinois | Enfield | 358 |
| | Springfield | 8 |
| 98th Ohio | Springfield | 306 |
| 113th Ohio | Enfield | 81 |
| | Springfield | 256 |
| 121st Ohio | Austrian .577 cal | 6 |
| | Springfield | 320 |
| 1st Illinois Light Artillery, Battery M | Napoleon | 4 |
| | 3" ord rifle | 2 |

| 2d Division, Brigadier General James D. Morgan | | |
|--|------------------|--------|
| Unit | Weapon Type(s) | Number |
| 2d Brigade | | |
| 85th Illinois | Enfield | 364 |
| | Austrian .54 cal | 95 |

| 2d Division, Brigadier General James D. Morgan | | |
|--|---------------------|--------|
| Unit | Weapon Type(s) | Number |
| 86th Illinois | Springfield | 8 |
| | French .58 cal | 351 |
| | Austrian .54 cal | 37 |
| 125th Illinois | Enfield | 335 |
| | Springfield | 5 |
| | Austrian .54 cal | 4 |
| 52d Ohio | Springfield | 406 |
| | Enfield | 2 |
| | Smoothbore .69 cal | 3 |
| | Fr. or Bel. .58 cal | 2 |
| 69 Ohio | Springfield | 460 |
| 2d Illinois Light Artillery, Battery I | Napoleon | 2 |
| | 10 pdr Parrot | 2 |

CAVALRY CORPS, BRIGADIER GENERAL ROBERT B. MITCHELL

| 1st Division, Colonel Edward M. McCook | | |
|--|--|--------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 2d Michigan | Springfield Colt R.R. Spencer rifle and carbine | |
| 9th Pennsylvania | Burnside carbine | |
| 1st Tennessee | Springfield Merrill carbine Gallager carbine | |
| 2d Brigade | | |
| 2d Indiana | Colt R.R. | |
| 4th Indiana | | |
| 2d Tennessee | Enfield | |
| 1st Wisconsin | Smoothbore .69 cal | 119 |
| | Enfield | 4 |
| | Springfield | 2 |
| 1st Ohio Light Artillery, Battery D (section) | | |

| 1st Division, Colonel Edward M. McCook | | |
|--|--------------------|--------|
| Unit | Weapon Type(s) | Number |
| 3d Brigade | | |
| 4th Kentucky | Enfield | 336 |
| | Springfield | 4 |
| | Smoothbore .69 cal | 6 |
| 5th Kentucky | Enfield | 319 |
| | Springfield | 3 |
| | Austrian .58 cal | 7 |
| 6th Kentucky | Enfield | 388 |
| | Model 1842 .58 cal | 32 |

| 2d Division, Brigadier General George Crook | | |
|--|-------------------|--------|
| Unit | Weapon Type | Number |
| 1st Brigade | | |
| 3d Indiana | | |
| 4th Michigan | | |
| 7th Pennsylvania | | |
| 4th United States | | |
| 2d Brigade | | |
| 2d Kentucky | | |
| 1st Ohio | Enfield | 327 |
| | Springfield | 32 |
| | Austrian .58 cal | 9 |
| 3d Ohio | Spencer carbines | |
| 4th Ohio | Enfield | |
| | Burnside carbines | |
| | Smoothbore .69 | |
| Artillery | | |
| Chicago (Illinois) Board of Trade Battery | 6 pdr howitzer | 5 |
| | 3" ord rifle | 4 |

APPENDIX B

ARMY OF TENNESSEE

ORDER OF BATTLE AND ORDNANCE TYPES

SEPTEMBER 1863

This was compiled from the following source: The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, Series I, Vol XXX, Part II-Reports.

The number of rifles listed herein are from two sources within the Official Records:

1. Ordnance reports noting numbers of weapons.
2. Official strength reports that differentiate between officers and soldiers. Soldiers are assumed to be armed with shoulder-fired weapons. Officers are assumed to be armed with pistols and so not included.

Close examination of these tables reveals weapon quantities that do not match strength reports. In some cases, records only show numbers of weapons in the tens or less for entire companies. Discrepancies in reporting and loss of complete data, especially for the Army of Tennessee, accounts for the inconsistencies. These records do accurately serve to show the numerous mixes of weapons ordnance officers had to support throughout the Chickamauga Campaign.

GENERAL BRAXTON BRAGG

RIGHT WING, LIEUTENANT GENERAL LEONIDAS POLK

| Cheatham's Division, Major General Benjamin F. Cheatham | | |
|---|------------------|--------|
| Unit | Weapons Type (s) | Number |
| Jackson's Brigade | unknown | 1,200 |
| 1st Georgia | | |
| 5th Georgia | | |
| 2d Georgia | | |

| Cheatham's Division, Major General Benjamin F. Cheatham | | |
|---|------------------|--------|
| Unit | Weapons Type (s) | Number |
| 5th Mississippi | unknown musket | 225 |
| 8th Mississippi | | |
| Smith's Brigade | | |
| 11th Tennessee | | |
| 12th/47th Tennessee | | |
| 18th/154th Tennessee | | |
| 29th Tennessee | | |
| Dawson's Sharp Shooters | | |
| Maney's Brigade | unknown | 1,156 |
| 1st/27th Tennessee | | |
| 4th Tennessee | | |
| 6th/9th Tennessee | | |
| 24th Tennessee | | |
| Wright's Brigade | | |
| 8th Tennessee | unknown | 260 |
| 16th Tennessee | unknown | 242 |
| 28th Tennessee | unknown | 264 |
| 38th Tennessee | unknown | 264 |
| 51st/52d Tennessee | unknown | 232 |
| Strahl's Brigade | | |
| 4th/5th Tennessee | | |
| 19th Tennessee | | |
| 24th Tennessee | | |
| 31st Tennessee | | |
| 33d Tennessee | | |
| Artillery | | |
| Carne's (TN) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 4 |

| Cheatham's Division, Major General Benjamin F. Cheatham | | |
|---|------------------|--------|
| Unit | Weapons Type (s) | Number |
| Scogin's (GA) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 2 |
| Scott's (TN) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 2 |
| Smith's (MS) Bty | Napoleon | 4 |
| Stanford's (MS) Bty | 3" ord rifle | 4 |

HILL'S CORPS, LIEUTENANT GENERAL DANIEL H. HILL

| Cleburne's Division, Major General Patrick R. Cleburne | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Wood's Brigade | | |
| 16th Alabama | | |
| 33d Alabama | | |
| 45th Alabama | | |
| 18th Alabama Bn | | |
| 32d/45th Mississippi | | |
| 15th Mississippi Bn | | |
| Polk's Brigade | | |
| 1st Arkansas | | |
| 3d/5th Confederate | | |
| 2d Tennessee | | |
| 35th Tennessee | | |
| 48th Tennessee | | |
| Deshler's Brigade | | |
| 19th/24th Arkansas | | |
| 6th/10th Texas Inf 15th TX Cav (dismounted) | | |
| 17th/18th/24th/25th Texas Cav (dismounted) | | |
| Artillery | | |

| Cleburne's Division, Major General Patrick R. Cleburne | | |
|--|------------------|--------|
| Unit | Weapon Type(s) | Number |
| Calvert's (AK) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 2 |
| Douglas' (TX) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 2 |
| Semple's (AL) Bty | Napoleon | 4 |

| Breckinridge's Division, Major General John C. Breckinridge | | |
|---|-----------------|--------|
| Unit | Weapon Type(s) | Number |
| Helm's Brigade | unknown | 1,260 |
| 41st Alabama | unknown | 366 |
| 2d Kentucky | unknown | 254 |
| 4th Kentucky | unknown | 243 |
| 6th Kentucky | unknown | 190 |
| 9th Kentucky | unknown | 207 |
| Adams' Brigade | unknown | 1,082 |
| 32d Alabama | | |
| 13th/20th Louisiana | | |
| 16th/25th Louisiana | | |
| 19th Louisiana | | |
| 14th Louisiana Bn | | |
| Stovall's Brigade | unknown | 818 |
| 1st/3d Flordia | unknown | 273 |
| 4th Florida | unknown | 217 |
| 47th Georgia | unknown | 178 |
| 60th North Carolina | unknown | 150 |
| Artillery | | |
| Cobb's (KY) Bty | 12 pdr howitzer | 1 |
| | Napoleon | 4 |
| Graves' (KY) Bty | unknown | |

| Breckinridge's Division, Major General John C. Breckinridge | | |
|---|-------------------------|--------|
| Unit | Weapon Type(s) | Number |
| Mebane's (TN) Bty | 12 pdr howitzer | 4 |
| Slocumb's (LA) Bty | Napoleon 6 pdr rifle | 4 2 |

RESERVE CORPS, MAJOR GENERAL WILLIAM H.T. WALKER

| Walker's Division, Brigadier General States R. Gist | | |
|---|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Gist's Brigade | | |
| 46th Georgia | | |
| 8th Georgia Bn | | |
| 16th South Carolina (not engaged) | | |
| 24th South Carolina | | |
| Ector's Brigade | | |
| Stone's (AL) Bn | | |
| Pound's (MS) Bn | | |
| 9th Texas | | |
| 10th Texas Cav | | |
| 14th Texas Cav | | |
| 32d Texas Cav | | |
| Wilson's Brigade | | |
| 25th Georgia | | |
| 29th Georgia | | |
| 30th Georgia | | |
| 1st Georgia Bn | | |
| 4th Louisiana Bn | | |
| Artillery | | |
| Ferguson's (SC) Bty (not engaged) | | |

| Walker's Division, Brigadier General States R. Gist | | |
|---|------------------|--------|
| Unit | Weapon Type(s) | Number |
| Howell's (GA) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 4 |

| Liddel's Division, Brigadier General St. John R. Liddell | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Liddell's Brigade | | |
| 2d/15th Arkansas | | |
| 5th/13th Arkansas | | |
| 6th/7th Arkansas | | |
| 8th Arkansas | | |
| 1st Louisiana (reg) | | |
| Walthall's Brigade | Mostly Enfield | |
| 24th Mississippi | | |
| 27th Mississippi | | |
| 29th Mississippi | | |
| 30th Mississippi | | |
| 34th Mississippi | | 281 |
| Artillery | | |
| Folwer's (AL) Bty | Napoleon | 4 |
| Warren Light Artillery (MS Bty) | | |

LEFT WING, LIEUTENANT GENERAL JAMES LONGSTREET

| Hindman's Division, Major General Thomas C. Hindman | | |
|---|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Anderson's Brigade | | |
| 7th Mississippi | | |
| 9th Mississippi | | |
| 10th Mississippi | | |

| Hindman's Division, Major General Thomas C. Hindman | | |
|---|-------------------------------------|--------|
| Unit | Weapon Type(s) | Number |
| 41st Mississippi | | |
| 9th Mississippi Bn | | |
| Garrity's (AL) Bty | 6 pdr smoothbore Napoleon | 2 2 |
| Dea's Brigade | | |
| 19th Alabama | unknown | 469 |
| 22d Alabama | | |
| 25th Alabama | | |
| 39th Alabama | unknown musket | 310 |
| 50th Alabama | | |
| 17th Alabama Bn | | |
| Dent's (AL) Bty | Napoleon | 6 |
| Manigault's Brigade | | |
| 24th Alabama | | |
| 28th Alabama | | |
| 34th Alabama | | |
| 10th/19th South Carolina | | |
| Water's (AL) Bty | 6 pdr smoothbore 12 pdr howitzer | 2 2 |

BUCKNER'S CORPS, MAJOR GENERAL SIMON B. BUCKNER

| Stewart's Division, Major General Alexander P. Stewart | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Johnson's Brigade | | |
| 17th Tennessee | | |
| 23d Tennessee | unknown | 132 |
| 25th Tennessee | | |
| 44th Tennessee | | |

| Stewart's Division, Major General Alexander P. Stewart | | |
|--|-----------------------------|---------|
| Unit | Weapon Type(s) | Number |
| Bate's Brigade | 1/3 rifled muskets | 1,085 |
| 58th Alabama | unk. type musket | 258 |
| 37th Georgia | unknown | 395 |
| 4th Georgia | unknown | est. 80 |
| 15th/37th Tennessee | unknown | 200 |
| 20th Tennessee | unknown | 152 |
| Brown's Brigade | | |
| 18th Tennessee | | |
| 26th Tennessee | | |
| 32d Tennessee | | |
| 45th Tennessee | | |
| 23d Tennessee | | |
| Clayton's Brigade | | |
| 18th Alabama | unk. type musket | 490 |
| 36th Alabama | unk. type musket | 401 |
| 38th Alabama | unk. type musket | 461 |
| Artillery | | |
| 1st Arkansas Bty | | |
| T.H.Dawson's (GA) Bty | 12 pdr howitzer Napoleon | 2 2 |
| Eufaula Artillery (AL) Bty | 3" ord rifle | 4 |
| Co E, 9th GA Aty Bn | | |

| Preston's Division, Brigadier General William Preston | | |
|---|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Gracie's Brigade | | 1,992 |
| 43d Alabama | | |
| 1st Alabama Bn | | |

| Preston's Division, Brigadier General William Preston | | |
|---|-----------------|--------|
| Unit | Weapon Type(s) | Number |
| 2d Alabama Bn | | |
| 3d Alabama Bn | | |
| 4th Alabama (Aty) Bn (serving as Inf) | | |
| 63d Tennessee | | |
| Trigg's Brigade | | 1,417 |
| 1st Flordia | | |
| 6th Flordia | | |
| 7th Flordia | | |
| 54th Virginia | | |
| 3d Brigade | | 1,037 |
| 65th Georgia | | |
| 5th Kentucky | | |
| 58th North Carolina | | |
| 63d Virginia | | |
| Artillery Battalion | | |
| Jeffress' (VA) Bty | 12 pdr Blakley | 1 |
| | 10 pdr Parrot | 4 |
| Peeples' (GA) Bty | 24 pdr howitzer | 2 |
| | Napoleon | 2 |
| Wolihin's (GA) Bty | unknown | |

RESERVE CORPS ARTILLERY

| Unit | Weapon Type(s) | Number |
|-------------------|------------------|--------|
| Baxter's (TN) Bty | 3" ord rifle | 2 |
| Darden's (MS) Bty | Napoleon | 4 |
| Kolb's (AL) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 2 |
| McCant's (FL) Bty | 6 pdr smoothbore | 3 |
| | 10 pdr Parrot | 1 |

| Johnson's Division, Brigadier General Bushrod R. Johnson | | |
|--|---------------------------------|--------|
| Unit | Weapon Type(s) | Number |
| Gregg's Brigade | | 761 |
| 3d Tennessee | | |
| 10th Tennessee | | |
| 30th Tennessee | | |
| 41st Tennessee | | |
| 50th Tennessee | | |
| 1st Tennessee Bn | | |
| 7th Texas | | |
| Bledsoe's (MO) Bty | 12 pdr howitzer 3" ord rifle | 2 2 |
| McNair's Brigade | | 1,107 |
| 1st Arkansas Mtd Rifles (dismounted) | | |
| 2d Arkansas Mtd Rifles (dismounted) | | |
| 25th Arkansas | | |
| 4th/31st Arkansas & 4th Arkansas Bn | | |
| 39th North Carolina | | |
| Culpeper's (SC) Bty | 12 pdr howitzer Napoeon | 2 1 |

LONGSTREET'S CORPS, LIEUTENANT GENERAL JAMES LONGSTREET

| McLaw's Division, Major General Lafayette McLaws | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Kershaw's Brigade | | |
| 2d South Carolina | | |
| 3d South Carolina | | |
| 7th South Carolina | | |
| 8th South Carolina | | |

| McLaw's Division, Major General Lafayette McLaws | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| 15th South Carolina | | |
| 3d South Carolina | | |
| Humphrey's Brigade | | |
| 13th Mississippi | | |
| 17th Mississippi | | |
| 18th Mississippi | | |
| 21st Mississippi | | |

| Hood's Division, Major General John B. Hood | | |
|---|----------------|--------|
| Unit | Weapon Type(s) | Number |
| Law's Brigade | | |
| 4th Alabama | | |
| 15th Alabama | | |
| 44th Alabama | | |
| 47th Alabama | | |
| 48th Alabama | | |
| Robertson's Brigade | | |
| 3d Arkansas | | |
| 1st Texas | | |
| 4th Texas | | |
| 5th Texas | | |
| Benning's Brigade | | |
| 2d Georgia | | |
| 15th Georgia | | |
| 17th Georgia | | |
| 20th Georgia | | |

RESERVE ARTILLERY

| Unit | Weapon Type(s) | Number |
|-----------------------|------------------|--------|
| Barret's (MO) Bty | 6 pdr smoothbore | 2 |
| | 12 pdr howitzer | 2 |
| Havis' (GA) Bty | Napoleon | 2 |
| | 6 pdr rifle | 1 |
| Lumsden's (AL) Bty | Napoleon | 3 |
| | 10 pdr Parrot | 1 |
| Massenburg's (GA) Bty | 10 pdr Parrot | 2 |

CAVALRY, MAJOR GENERAL JOSEPH WHEELER

| Wharton's Division, Brigadier General John A. Wharton | | |
|---|---|--------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| Malone's Alabama Reg. | | |
| 2d Georgia | | |
| 3d Georgia | | |
| 4th Georgia | | |
| 2d Brigade | | |
| 3d Confederate | | |
| 3d Kentucky | | |
| 4th Tennessee | | |
| 8th Texas | Austrian .54 cal Bel. & Fr. .69 cal Smoothbore .69 cal M1854 "Mississippi" Burnside carbine | |
| 11th Texas | Hall carbine M1854 "Mississippi" | |
| White's (TN) Bty | unknown | 6 |

| Martin's Division, Brigadier General William T, Martin | | |
|--|----------------|--------|
| Unit | Weapon Type(s) | Number |
| 1st Brigade | | |
| 1st Alabama | | |
| 3d Alabama | | |
| 51st Alabama | | |
| 8th Confederate | | |
| 2d Brigade | | |
| 4th Alabama | | |
| 1st Confederate | | |
| J.H.Wiggin's (AK) Bty | | |

FORREST'S CORPS, BRIGADIER GENERAL NATHAN B. FORREST

| Armstrong's Division, Brigadier General Frank C. Armstrong | | |
|--|--|-------------|
| Unit | Weapon Type(s) | Number |
| Armstrong's Brigade | | |
| 3d Arkansas | | |
| 2d Kentucky | | |
| 6th Tennessee Bn | | |
| 18th Tennessee Bn | | |
| Forrest's Brigade | | |
| 4th Tennessee | | |
| 8th Tennessee | | |
| 9th Tennessee | | |
| 10th Tennessee | | |
| 11th Tennessee | | |
| Shaw's Bn, Hamilton's Bn, Allison's Squadron | | |
| Huggin's (TN) Bty | 6 pdr smoothbore 12 pdr howitzer unknown cal | 2 1 2 |

| Armstrong's Division, Brigadier General Frank C. Armstrong | | |
|--|------------------|--------|
| Unit | Weapon Type(s) | Number |
| Morton's (TN) Bty | 6 pdr smoothbore | 2 |
| | 3" ord rifle | 2 |

| Pegram's Division, Brigadier General John Pegram | | |
|--|-------------------|--------|
| Unit | Weapon Type(s) | Number |
| Dividson's Brigade | | |
| 1st Georgia | | |
| 6th Georgia | | |
| 6th North Carolina | | |
| Rucker's (TN) Legion, 12th/16th TN Bns | | |
| Huwald's (TN) Bty | 12 pdr mtn. how. | 2 |
| | rifled piece unk. | 2 |
| Scott's Brigade | | |
| 10th Confederate | | |
| Det. from Morgan's command | | |
| 1st Louisiana | | |
| 2d Tennessee | | |
| 5th Tennessee | | |
| Robinson's (LA) Bty | 12 pdr mtn. how. | 4 |
| | rifled piece unk. | 2 |

APPENDIX C

ARMY OF TENNESSEE

STATEMENT OF ORDNANCE CAPTURED

DURING THE BATTLE OF CHICKAMAUGA

19-20 SEPTEMBER 1863

Compiled from the statement of captured stores reported by Capt. O.T. Gibbes, Ordnance Officer, at Ringgold, Georgia from the following source: The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, Series I, Vol XXX, Part II--Reports, p 40-43.

| <u>ARTILLERY</u> | <u>Number Captured</u> |
|---|------------------------|
| 12-pounder iron howitzer with carriage | 5 |
| 12-pounder bronze gun with carriage and limber | 1 |
| 12-pounder bronze gun | 1 |
| 12-pounder bronze howitzer, with carriage | 10 |
| 12-pounder bronze mountain howitzer, with carriage and limber | 6 |
| 12-pounder bronze mountain howitzer, with carriage | 1 |
| 12-pounder howitzer, with carriage and limber | 4 |
| 12-pounder rifled gun, with carriage | 1 |
| 6-pounder bronze gun, with carriage and limber | 10 |
| 6-pounder bronze gun, with carriage | 1 |
| 3-inch steel rifled gun | 1 |
| 3-inch iron rifled gun, with carriage and limber | 3 |
| 3-inch iron rifled gun | 2 |
| 3-inch rifled gun, with carriage | 1 |
| 3.8-inch rifled gun, with carriage and limber | 5 |
| 3.8-inch bronze rifled gun, with carriage and limber | 4 |
| 3.8-inch bronze rifled gun | 1 |
| 24-pounder bronze howitzer, with carriage and limber | 1 |
| 24-pounder howitzer, with carriage and limber | 2 |

ARTILLERY AMMUNITION CAPTURED

| TYPE | SOLID SHOT | CANISTER | SHELL | SPHERICAL CASE |
|------------------------|------------|----------|-------|-------------------|
| 6-pounder | 341 | 133 | 25 | 93 |
| 12-pounder gun | 83 | 60 | 92 | 61 |
| 12-pounder mountain | -- | 223 | 245 | -- |
| 12-pounder howitzer | -- | -- | -- | 255 |
| 24-pounder | -- | 12 | -- | 98 |
| 10-pounder Parrot | -- | -- | 104 | -- |
| 20-pounder Parrot | -- | -- | 120 | -- |
| 6-pounder rifle | 12 | -- | 21 | -- |
| 3" rifle | -- | -- | 48 | -- |
| 3.2" shot | 13 | -- | -- | -- |

SMALL ARMS

Small arms 23,281

Cartridges (for small arms) 135,000

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